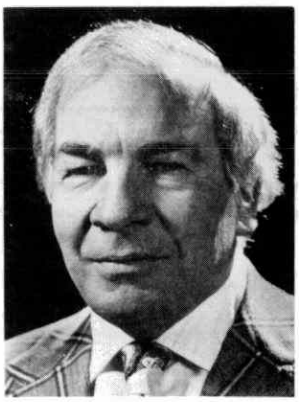
Annual report 1973-74.



To:

The Honourable
William G. Newman, Minister.

Sir,

I have the honour to submit for your approval the 1973/74 annual report of the Ministry of the Environment.

Respectfully submitted,

Everett Biggs

EVERETT BIGGS
DEPUTY MINISTER

To:

Her Honour,
The Lieutenant-Governor of the Province of Ontario.

May it please Your Honour,

I have the honour to present the annual report of the Ministry of the Environment for the fiscal year beginning April 1, 1973 and ending March 31, 1974

Respectfully submitted,

William G. Newman

WILLIAM G. NEWMAN
MINISTER

PROGRESS REPORT

Ontario was one of the world's first jurisdictions to initiate a program of comprehensive environmental protection and rehabilitation.

In April, 1972 the various elements of environmental protection previously established under other Ministries of the Government of Ontario were assembled within a new, cental agency — The Ministry of the Environment.

During the past two years, much of the activity of the Ministry has been devoted to the refining of legislation, to the establishment of an improved structure of the Ministry and to the development of programs aimed at providing the comprehensive environmental control for which our Ministry was designed.

Public participation in the decision-making process was encouraged and a series of public meetings were held to accommodate this on-going objective.

In 1973, Bill 91 was approved and early in 1974 legislation was proclaimed which amalgamated appropriate sections of the Pesticides Act, The Environmental Protection Act and The Ontario Water Resources Act pertaining to the application of pesticides to water.

Additional regulations relating to deep well disposal and to derelict motor vehicles were registered under the Environmental Protection Act later in the year.

As an extension of our continuing research in solid waste disposal and management, we conducted a major study aimed at the development of an experimental resource recovery plant for the investigation of specific, commercially viable aspects of solid waste reclamation, re-use and recycling of resources.

Construction of the Ministry's resource recovery centre and experimental plant is scheduled to get underway in 1975 and it is expected that the plant will become operational later in the year.

During 1974, the report on beverage containers was completed by the Ministry-appointed task force on solid waste. This report is intended to support the development of policy governing pollution and littering resulting from commercial packaging of beverages.

Aware of the need to develop new methods to dispose of the approximately eight million tons of garbage generated in Ontario each year, the Ministry appointed a committee to review the practicability of disposing of municipal waste through burning in utility boilers.

Based on this committee's study, the Ministry initiated the 'Watts from Waste'' program. Funds were allocated jointly to the Ontario Hydro-Electric Power Commission of Ontario and the Municipality of Metropolitan Toronto for the establishment of a pilot waste disposal plant at the Hydro Commission's Lakeview Generating Station in Mississauga.

When completed this plant will provide energy for operation of the generating station through the burning of solid waste.

Rising noise levels in our major urban areas continue to be an area of increasing public concern. In response to the growing need to combat noise pollution, several basic research projects were undertaken by this Ministry and a noise control program was developed for implementation in the near future.

In order to make the services of our Ministry more readily available to the public, the Ministry was reorganized to provide service and control functions on regional levels.

The establishment of six regional offices and 23 district offices within these regions was effected on April 1, 1974 and the Ministry was re-aligned.

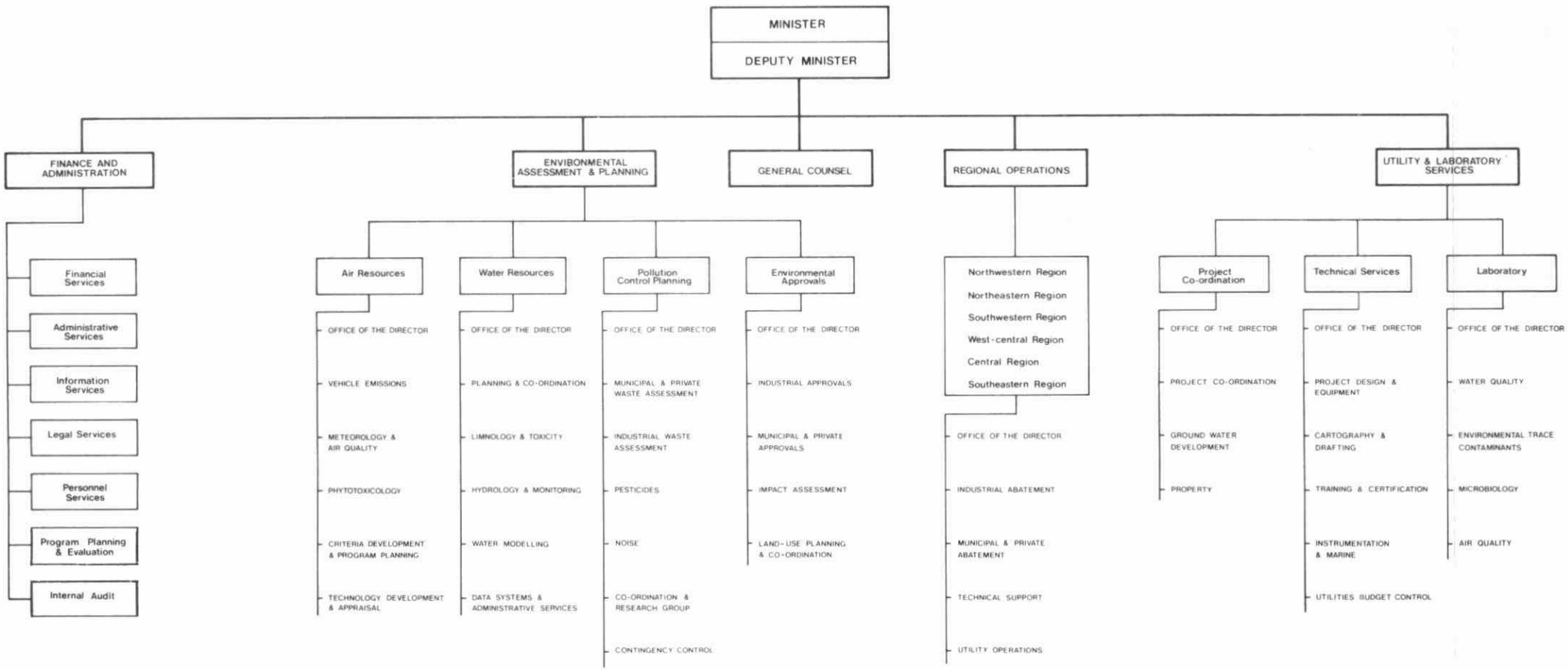
As a result of the Ministry's regionalization program, the normal services of this ministry are now accessible to the public through regional offices in Thunder Bay, Sudbury, London, Hamilton, Don Mills and Kingston. Each of these offices provides a complete staff under a regional director and is equipped to deal with environmental problems of control and rehabilitation on a local level.

This program is consistent with the Ministry's objective to serve the public efficiently and quickly and to meet urgent challenges in every sector of our province.

We are confident that the regional structure of our Ministry provides a firm, province-wide base upon which to structure effective programs which will be required of us in the future.

William G. Newman,
Minister.

Ministry of the Environment
October, 1974



CONTENTS

OPERATING DIVISIONS

Air and Land Pollution Control

Air Management

The Air Management has continued to ensure that the quality of the ambient air in Ontario will be sufficient to avoid adverse effects on human and animal health, personal well-being, plant life and the quality of the natural environment. Its program controls, by prudent management, the impact of man on the air environment by correcting existing undesirable effects, by monitoring contaminant levels, and by research and development efforts to ensure the future air quality. A desirable level of air quality is defined by appropriate criteria and standards which are continuously reviewed and revised as necessary. A significant portion of the program has been devoted to providing a service to the public. Prompt response has been given to complainants (and abatement of the sources initiated); to requests for information; to requests for speakers, and to inquiries from the general public, industries, and the news media.

During the 1973/1974 season, the activities of the Branch have greatly increased, with significant emphasis on noise abatement, land use planning, air quality monitoring, greater control of truck emissions, and various other areas.

Noise Control

A six-point noise control program was established for implementation throughout Ontario. The phases of this program are as follows:

(a) prepare and implement a regulation to control noise from roadway vehicles

(b) prepare and implement a regulation to control noise from stationary sources

(c) establish ambient noise level objectives

(d) develop a model municipal by-law for use by municipalities

(e) prepare and implement a regulation to control noise from recreational devices

(f) develop expertise and guidelines to be able to comment on land use changes as they are affected by noise.

To implement this program, the initial emphasis was given to those areas that had resulted in the majority of noise complaints received by the Ministry. Roadway vehicles and stationary sources accounted for 80 per cent of all complaints; hence, regulations to control noises from these two sources were given priority. The Noise Pollution Control Section produced a draft regulation to control the noise from roadway vehicles and implemented a field trial of the regulation in Hamilton in March, 1974. This and other field trials will be the final test of the regulation before implementation. In preparing this regulation, approximately 1,000 measurements of many different types of vehicles were made.

The second regulation, to control stationary source noise, is in the final stages of preparation and will be field tested during the summer of 1974. To gather data for the drafting of this regulation, inspectors, investigated noise complaints in both Toronto and Hamilton. During the year, approximately 350 complaints were received, of which 130 were investigated. It is interesting to note that although the regulation was at this time only in the draft stage, 60 of the complaints were resolved through the efforts of the Noise Pollution Control Section staff.

Community Studies

In addition to preparing regulations to control noise, community studies were undertaken in London, Woodstock, Kingston, North Bay and Sault Ste. Marie. These studies were conducted to provide an understanding of noise levels in communities, and at the same time, to provide information for the establishment of ambient noise level objectives for the Province.

Approvals and Criteria Section

With regard to planning and zoning, and reflecting our increased emphasis on the importance of effective land use planning, the Approvals and Criteria Section of this Branch responded to a total of 379 situations, compared with 215 the previous year. This sharp increase reflects the growing realization by both officials and the general public of the significance of ambient air quality to any decisions concerning land development. In recognition of the increasing need for improved service in this field, personnel have been assigned full time to the task of establishing air quality criteria for the development of land use in problem areas, and to the evaluation of proposals for land usage change.

Comments and recommendations were made to the Ontario Development Corporation on a total of 310 companies requesting financial assistance. An additional 57 companies which made requests for financial assistance through the Ontario Business Incentive Programs were assessed from the standpoint of air pollution potential. The above total is approximately double the number handled the previous year.

Certificates of Approval

In addition to the foregoing, the Branch continued to process applications for Certificates of Approval. The number of these applications, at 2243, was a reduction from the 2747 total received during the previous year. Likewise, the number of claims for sales tax rebate for pollution control equipment installed by various industries and companies throughout Ontario showed a

reduction of 174 from the previous year's 270. However, the total value of the claims received, at $1,484,000 was higher than the previous year's total of $1,100,000. The amount recommended for payment of grants was $656,000 while the value of claimes rejected was $534,000. The amount of claims still outstanding totals $284,000 and is included in 22 claims.

Air Quality Monitoring

With regard to the monitoring of air quality throughout Ontario, great strides were made in increasing both facilities and activities. The network of air quality and meteorological stations with the numbers of instruments in operation increased as indicated in Figure I.

AIR QUALITY AND METEOROLOGY SECTION
NUMBER OF INSTRUMENTS IN OPERATION.

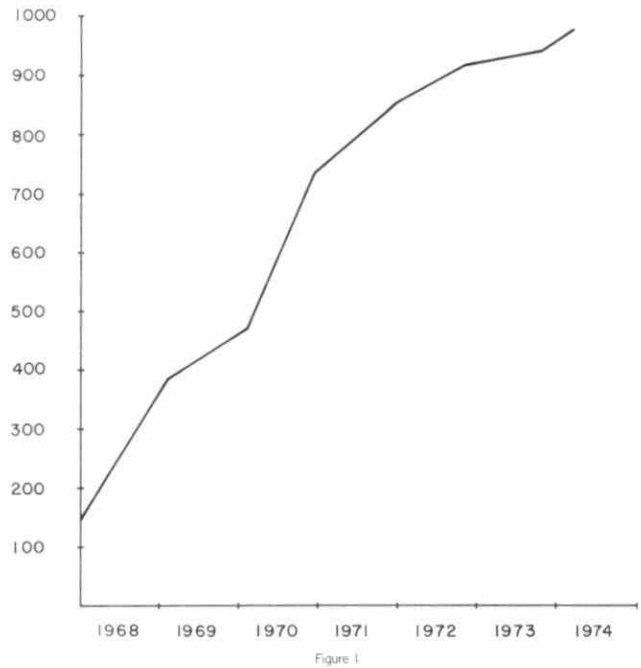


Figure I

Nine hundred and seventy-five instruments are being operated at over fifty communities located in all regions of the Province (see Figure II). Approximately two million data points were obtained by measuring devices, processed by Ontario Government computer facilities and interpreted in air quality reports. During 1973/1974 a marked increase occurred in the number of instruments utilized for monitoring lead in both respirable particulate matter which remains suspended in the air, and that which may remain in fallout, causing soil damage.

Eight stations located in the Sudbury airshed were winterized to allow for all-year monitoring. The sulphur dioxide analyzers were updated with new more reliable instruments and two additional recording stations were installed at Hanmer and Coniston. Monitoring stations were established in Oakville, Burlington and near the Bruce Heavy Water Plant.

An Air Pollution Index Station was established in Welland early in 1974 to add this city to that of Toronto, Hamilton, Windsor and Sudbury, for which the Air Pollution Index is publicized daily and for which the Alert System is enforced.

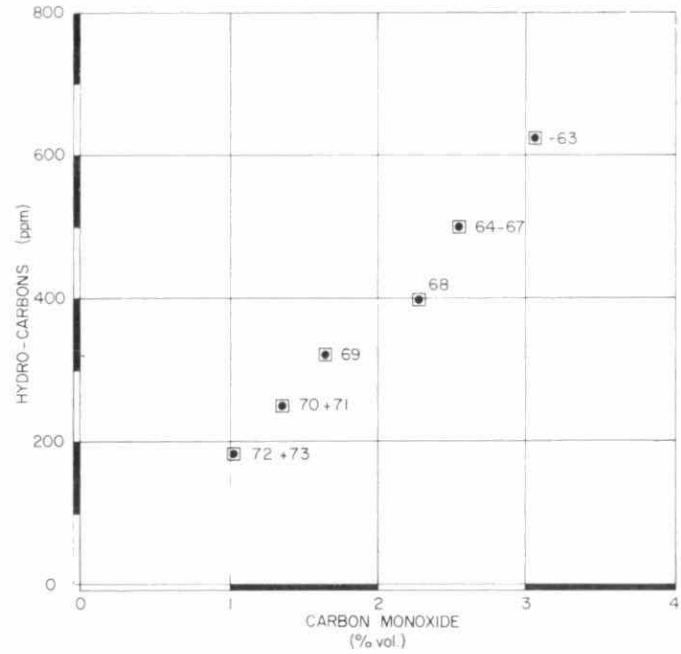
Meteorological instruments were installed on a 150-foot tower in the Niagara Peninsula for the purpose of provinding the necessary data for identifying the sources of pollution in the area.

Trans-Boundary Co-operation

A co-operative program was established with the New York State Department of Environmental Conservation and the Air Pollution Control Division of Erie County, to monitor the air quality along both sides of the International Boundary and to determine with the assistance of Ontario's air pollution model, the transboundary flow of air contaminants.

The air pollution model for Hamilton was refined to provide an accurate simulation of the air quality with respect to particulate matter over that city. Fugitive dust emissions from ore and coal piles were simulated for use in the validation of particulate concentrations in Hamilton.

REDUCTION IN CAR EXHAUST EMISSIONS



... hot start test results of different model years of cars, (over 140 CID, corrected to 50,000 miles).

Figure II

Finally, the Air Quality and Meterology Section used air pollution simulation models to determine the impact of several new industries on air quality. The model was also used to assess the effect of Ontario Hydro's use of various types of coal and oil for consumption in their thermal generating stations.

Automotive Emissions Program

To control excessive smoke emissions from diesel powered, heavy-duty vehicles, mainly trucks and tractors, the Ministry initiated a co-operative program with four different Ontario Provincial Police detachments (in Port Credit, Downsview, Whitby and Burlington), during which over 640 vehicles were stopped. In two-thirds of the cases, charges were laid against the vehicle owner under The Highway Traffic Act. As a result of this program, the frequency of excessively smoking vehicles, as observed in recent months, has decreased considerably.

From December 1973 through March 1974, the Automotive Control Section also focussed its attention on the taxi-cab population in Toronto and vicinity. Over 1,600 taxis were checked for controls and emissions while undergoing regular checks for safety. Results are now being evaluated for the frequency of excessive emitters and inoperative control systems. This data will

be used to design compliance standards for similar vehicles which operate in densely populated areas.

This section continued with activities initiated in previous years. A total of 7,200 cars were tested (fully or using idle-modes procedures) in Toronto and in six other municipalities visited by the two mobile laboratories. Evaluation of accumulated data confirmed a considerable and consistent year-by-year reduction in hydrocarbon and carbon monoxide emissions. As shown in Figre III, emissions from late model cars (72,73) are, on the average, less than one-third of emissions from pre-controlled (64-67) models. All tests results are compared at the 50,000 miles point. Systematic monitoring of cars also provided the Ministry with vital statistical data necessary for assessment and planning of air quality and development of future control measures. An additional 220 special tests were performed mainly to assess the capabilities of various control devices to reduce automotive pollutants.

The program of demonstrations to student-mechanics in the municipal colleges all over Ontario was continued with the objective of emphasizing the extensive use of modern analytical equipment during regular tune-ups performed on new and on-road vehicles. Over 90 demonstrations were organized during the 26 trips to nine colleges (located in London, Belleville, Hamilton, Guelph, Scarborough, Ottawa, Cornwall, Windsor and Sault Ste. Marie), where lectures and demontrations were presented to an estimated 1,950 students and local mechanics.

During 1973/1974 the Abatement Section continued in its program of improvement of service to the public by the implementation of an information and retrieval system. Emphasis was placed on the south-western region of Ontario for information assimilation and compilation.

As a result of abatement action undertaken by engineers and inspectors, a further 36 companies submitted programs for approval by the Director under section 10 of the Act. Two Stop Orders were issued. However, these were subsequently set aside by the courts.

Most notable of these abatement programs are the odor control programs formalized for the Metropolitan Toronto Sewage Treatment Plants and the Ontario Hydro Electric Power Commission, Bruce Heavy Water Plant at Douglas Point. Also included are a number of brass and bronze foundries, food processing plants and petrochemical operations.

A total of 885 voluntary abatement problems were completed, with expenditures for pollution control equipment exceeding $43,700,000. Three Control Orders and 18 Program Approvals were completed in the fiscal year 1973/1974, (Figure V).

A total of 32 prosecutions were conducted for air pollution offences under the Act, resulting in 24 convictions and fines totalling $13,900.

Agricultural Activities

The evaluation of poultry and livestock farms with regard to the agricultural code of practice was continued in co-operation with the Ontario Ministry of Agriculture and Food. A total of 586 applications were received and 455 Certificates of Compliance were issued. A Farm Pollution Advisory Committee was appointed jointly by the Ministers of Agriculture and Food and Environment to review and report on farm problems throughout the Province. Fourteen farms were visited by the Committee. As a direct result of these, a marked improvement in farming practices was noted in six cases. Three Control Orders were issued. The Committee also made note that in a number of cases good farm management was evident but zoning was such that the odor problems could not be readily resolved.

"Watts From Waste"

The Ministry of the Environment recognized the growing public concern about garbage disposal and formed a committee to review the suitability of burning municipal refuse in utility boilers. A member of the Abatement Section was appointed to this "Watts from Waste" committee. As a result of the committee's findings, funds have been allocated to set up a pilot plant at the Ontario Hydro Electric Power Commission's Lakeview Generating Station.

Phytotoxicological Surveys

The Ministry of the Environment was responsible for the conduction of various significant phytotoxicological surveys throughout the Province during the 1973/1974 season. A comprehensive forest damage survey northeast of Sudbury showed the presence of both acute and chronic injury on trees. However, the general condition of the vegetation in the Sudbury areas was markedly improved over previous years. A number of factors can be cited as contributing to this improvement, these being the operation of the 1250-foot high stack at Copper Cliff throughout 1973, the shutdown of the smelter at Coniston throughout 1973, the shutdown of the pyrrhotite and elemental sulphur plants at Falconbridge throughout 1973, and a three-week shutdown of the iron ore plant and smelter at Copper Cliff during the growing season of 1973.

The occurrence of black pools of water on the ice surfaces of lakes in northern Ontario in the spring of 1973 was attributed to numerous and varied sources. Some were man-made (snowmobile exhaust, fires and mining operations) and some were found to be caused by natural runoff or erosion of soil from the shore.

A number of surveys were conducted for the occurrence and incidence of photochemical oxidant (ozone and PAN) injury to farm crops in southwestern Ontario.

An area of approximately one million acres displayed evidence of moderate to severe ozone injury on white bean crops under cultivation. The "ozone bronzing" of white bean crops was more severe in 1973 than in 1972. Tomato crops suffered from peroxyacetyl nitrate (PAN)-type injury in two large areas in southwestern Ontario in 1973, one area being immediately east of Windsor and the other in the Simcoe-Niagara region.

Phytotoxicology surveys conducted in the vicinity of 45 potential lead sources in Ontario showed excessive levels of lead in soil and vegetation in the vicinity of 26 companies, of which 14 were located in the Toronto area.

All in all, a total of 1,640 surveillance station visits were made by our phytoxicological staff in 1973/74, the foregoing being the significant results.

Complaints Investigation

In addition to these ecological surveillance programs, a total of 250 vegetation complaints were investigated in 1973/1974, comprised of 65 internal abatement

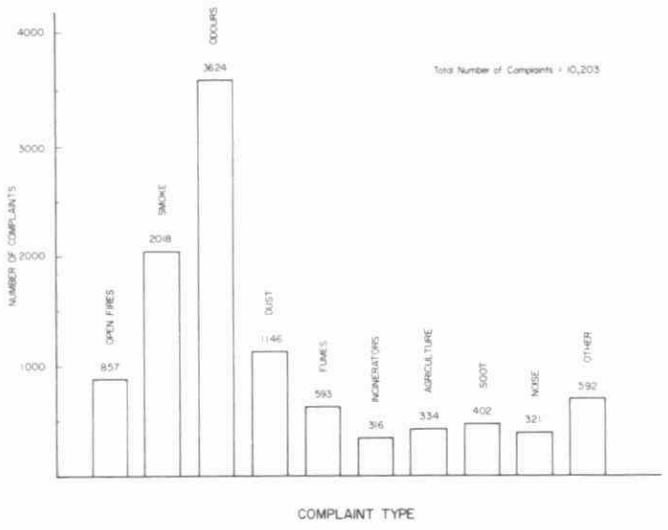


Figure IV

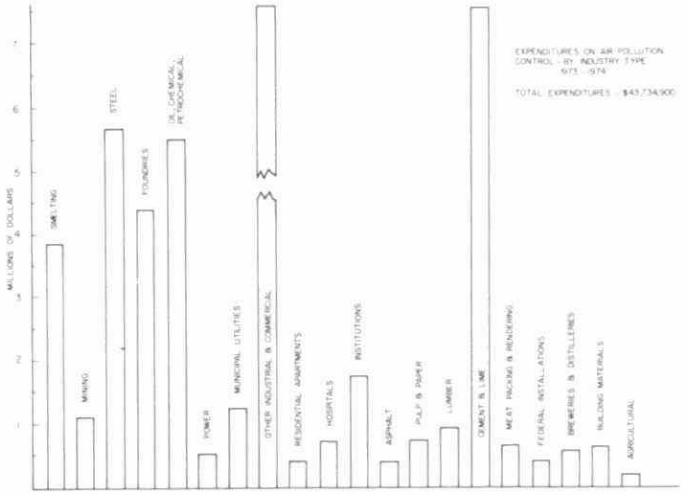


Figure V

requests and 185 external public complaints. Over 60 per cent of the vegetation injuries on external complaints visits were diagnosed as being caused by agents other than environmental contaminants such as disease organisms, insects, physiological disorders and natural causes. Contaminants found causing vegetation injuries were fluorides, sodium hydroxide, sodium chloride, sodium sulphatechlorine, nickel, cobalt, sulphur dioxide, ammonia, hydrogen chloride, oil, oxygen, displacing ases in the soil, heat, photochemical oxidants, dust, and iron oxide.

Sources of the contaminants were extremely varied and included the following: a fertilizer manufacturer, seed processor, fur dresser, highway traffic, pulp and paper mills, zinc and nickel refineries, nickel and copper smelters, ammonia and HCL tank leaks, oil pipeline, break, land fill operation, asphalt road resurfacing, atmospheric photochemical reactions, a quarry, and a steel refinisher.

Reports of confirmed pollution-caused injuries were sent to the regional abatement staff to prevent recurrence of contaminant emissions, to the complainant, to the offending source, and to the Board of Negotiation to effect satisfactory compensation for damages.

Figure VI illustrates the increase in phytotoxicological complaints and surveillance investigations during the three-year period April 1, 1971 to March 31, 1974.

A total of 10,200 complaints was received in the fiscal year. They are broken down by category in the attached graph (Figure IV). In responding to these complaints a total of 715 industrial and commercial establishments were surveyed, culminating in 19 detailed survey reports under section 83 of The Environmental Protection Act, 1971. Seventeen companies were issued with a Notice of Intent to serve a Control Order, with nine Control Orders subsequently issued and eight companies electing to submit formal abatement programs.

Expansion of Programs

Due to pressing environmental concerns during the fiscal year 1973/1974, the Air Management Branch expanded its scientific and research oriented approach to various problems. For example, a major sampling, monitoring program for 16 lead plants in Ontario was initiated in the latter part of the fiscal year. Attention was given to a better definition of environmental lead levels and the sources of lead emissions, and the program proceeded in parallel with implementation of major control measures at the lead companies.

A Working Committee on Lead was set up, comprised of representatives of the Ministries of Health and Environment, and of Municipal Government, to review available data and to assess the total situation. An Interim Report was issued in early 1974 by the Committee, but, because the blood sampling programs were incomplete, no assessment of health effects could be made. The Committee is now compiling and indexing all data for computer use so that relationships between environmental lead levels and blood lead can be determined. An expanded lead monitoring program is planned for the 1974/1975 fiscal year.

Research

The Air Management Branch continued to actively support a variety of research programs in specific air quality problem areas of the Province. Grants and contracts totalling $260,000 were awarded to universities and non-profit organizations to investigate long-term environmental effects of atmospheric emissions from major industrial sources, and to study the contributing factors in the formation of visible urban "plumes". Additional knowledge was gained about the fate of atmospheric pollutants emitted by copper and nickel smelters. Research also demonstrated that LIDAR, a remote sensing technique used in studies of stack plume behaviour, could greatly assist and complement conventional techniques. LIDAR was successfully applied to study the dispersion of emitted materials in an urban atmosphere.

Stack Survey

In conjunction with the Process Technology Group of the International Nickel Company of Canada, the Air Management Branch conducted an emission survey in the 1250-foot stack at the Copper Cliff smelter. The objectives of the joint survey were to assess potential effects of air quality of emissions from the stack under normal operating conditions, to check INCO's compliance with the Ministry control program concerning emission of sulphur dioxide from the smelter operation, and to study how weather conditions affect plume dispersion from a stack of this height. One of the results of this survey indicated that INCO was indeed complying

with the terms of the Control Order issued by the Ministry concerning sulphur dioxide emissions from the tall stack.

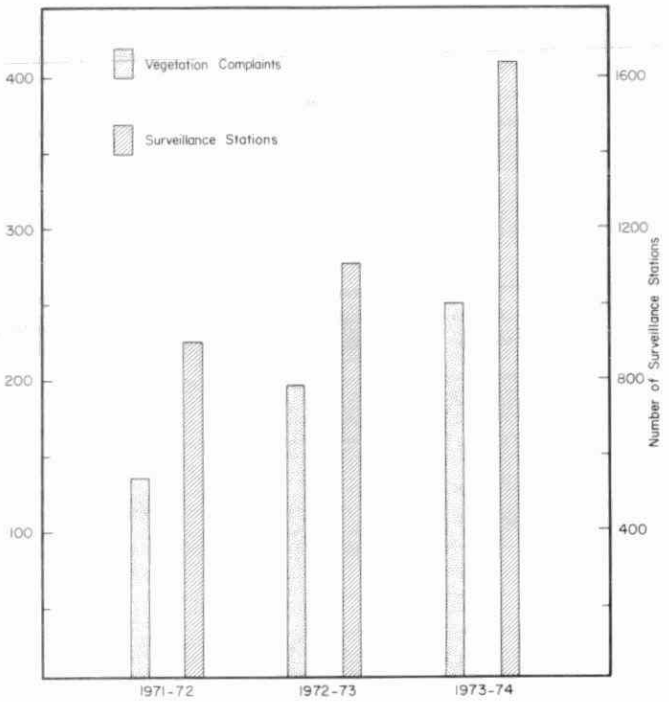


Figure VI

The Air Management Branch also sponsored two training schools for the purpose of instructing selected Ministry personnel in the art of stack sampling. The schools were conducted for the Ministry personnel from the Chemical Engineering Department of the University of Windsor, and ensured that every region in the Province would be supplied with staff who were familiar with the principles of stack sampling.

PESTICIDES CONTROL

The Pesticides Control Service is responsible to promote and ensure the proper use of pesticides and to prevent excessive and improper uses of those chemicals that adversely effect man and the environment. The main components in the program include regulation of operators and products through a system of licences, permits and classification; investigation and inspection for enforcement and assessment purposes, and education of the public and industrial sectors through training and publication processes.

Field offices were increased from five to six with the opening of one in Thunder Bay. A biologist joined the Service in March and will serve as the aquatic nuisance specialist and deal with mosquito and biting fly activities.

Legislation

The program is carried out under the Pesticides Act and The Environmental Protection Act. During the year, Bill 91 was passed and is expected to be proclaimed in 1974. It amalgamates the appropriate legislation from The Pesticides Act and The Environmental Protection Act and invorporates that portion of The Water Resources Act pertaining to the application of pesticides to water. The responsibility for regulation of this activity was transferred to the Service in March 1974. Redrafting of regulations in accordance with Bill 91 was in progress.

Licences and Permits

The program of issuing licences and permits to control the storage, vending and application of pesticides, the restrictive use of certain pesticides and the limiting use of products in relation to need was continued.

A total of 11,232 licences were issued. Included were 597 to operators, 4,591 to land exterminators, 252 to structural exterminators, 110 to assistant structural exterminators and 3,682 to wholesale and retail vendors.

The substantial increase in the number of licences issued over the previous year was primarily due to the introduction in November 1972, of the licensing system for storing, vending, and purchasing of pesticides. This program also involved the inspection of all premises involved in the sale or storage of pesticides, and providing information and assistance to help vendors meet licensing, sales, storage and display requirements. An offshoot of the program was the need to assist vendors and the public in the disposal of restricted pesticides and arrangements were made to pick up, package and store these products. This program was also supported by Environment Canada.

Permits were issued for the use of methyl bromide or cyanogas fumigations, for the application of pesticides restricted under the vendor's program, for importation or for aerial applications of hormone herbicides. The number of permits increased from last year due to the vendor's program.

Investigations

A major part of the field activities continued to be the investigation of abuse or misuse of pesticides. Complaints regarding unlawful applications, efficacy of applications, spray drift, environmental contamination and poisonings were investigated, and reports with recommendations and conclusions compiled.

Three fires involving pesticides were investigated. Two fires caused no significant problem, the third fire occurred at a manufacturing site and required extensive work in the areas of clean-up, removal and decontamination without hazard to the natural environment. Three prosecutions were initiated which resulted in two convictions and one is pending trial.

Sampling programs originated based on investigations concerning pesticide spillage, spray drift complaints or the misuse of a pesticide. A fish kill in a creek led to a sampling program in an attempt to determine the source of the pesticide.

With the advent of the vendor program less time than normal was available for special studies. However, several monitoring programs were initiated in cooperation with OMA&F Pesticide Residue Testing Laboratory, Extension Specialists and the Water Quality Branch of our Ministry. These programs should provide insight into the movement of pesticides from roadsides and agricultural areas into marshland areas and waterways.

Two cholinesterase activity clinics were held in orchard growing areas to determine if the farmers in these areas were subjected to organo phosphorous insecticide contamination. No serious problems were found. Another program is monitoring the effects of triazine residues in soil on newly planted fruit trees.

Education and Information

Education and communication continued to be important parts of the program.

Staff participated and assisted at meetings held by this Ministry, agricultural colleges, community colleges, OMA&F municipalities, pesticide industry and agricultural growers through presentations concerning the Pesticides and Environmental Protection Acts and their regulations. In addition, the staff has disseminated information to all segments of the pesticides industry and the public at exhibits.

Internal meetings were held to discuss our New Pesticides Act, problems and solutions to the regulations.

An information program regarding pesticides was initiated for the fire fighting personnel across the province. Staff continued to consult, advise and cooperated with personnel from the federal, provincial and municipal governments, pesticides industry and the general public.

Four issues of News and Views were published. This publication consists of abstracts from a voluminous source of pesticide resouce material and has inter-

national distribution.

Exhibits were set up in conjunction with our Information Services at exhibitions and fairs across Ontario. Three one-day short courses were held to bring licensed pest control operators and exterminators up-to-date with our legislation and other new information related to their work. Pesticide educational programs were held across the province at community colleges. Under this program, 896 certificates were issued by the Service. A herbicide correspondence course was carried out with people from the Federal Penitentiary Institution at Millhaven. Sixteen people obtained certificates.

New publications were written and others were rewritten and updated by the Service. A new publication "Controlling Mosquitoes and Black Flies in Ontario", was published jointly with the Ministry of Natural Resources. This booklet describes the life cycles of the mosquito and black fly control programs, personal protection, permit requirements and insecticide recommendations.

Staff prepared and distributed 941 sets of study material for applicants for operators and exterminators licences. The examining committee examined 925 applicants for operators or exterminators licences. This represents an increase of 11 per cent over the previous year. The failure rate was 9.6 per cent.

Pesticides Advisory Committee

Membership in the Committee at the present include the following:-

Chairman
K. G. Laver, B.S.A.
Vice-Chairman
G. S. Cooper, B.A., B.Sc., M.Sc., Ph.D.
Members
D. A. Chant, B.A., M.A., Ph.D., F.R.E.S.
R. Frank, B.Sc., M.S.A., Ph.D.

C. R. Harris, B.A., M.A., Ph.D.
J. C. Ingratta, B.S.A.
P. M. Lindley, B.S.A.
F. L. McEwen, B.Sc., M.Sc., Ph.D.
E. F. Muir, B.S.A.
G. R. Stephenson, B.Sc., M.Sc., Ph.D.
G. J. Stopps, M.B., B.S.
K. B. Turner, B.Sc.F., M.Sc.F.
Executive Secretary
A. R. Chisolm, P.Ag.

The following matters were reviewed and reports filed with the Deputy Minister:-

1. Mosquito Abatement Programs in Ontario;
2. The Advisability of Reinstating DDT for Mouse Control in Structures;
3. Guidelines on the Importation of Unregistered Pest Control Products for Commercial Production of Plants and Animals;
4. The Availability of Liability Insurance for Pesticide Users;
5. The Control of Japanese Beetles in Ontario;
6. Soil Insects in Ontario, 1900 to 1973;
7. A review of the Status of Chlordane and Heptachlor With Regard to Their Use in Ontario;
8. Pest Control Research Tabulation in Ontario, 1973-1974.

The Committee is divided into sub-committees for review purposes. Members with special interests are selected to meet and discuss problems associated with their expertise. The sub-committees are:-

(1) Insecticide-Fungicide Evaluation — sub-committee Chairman, Dr. R. Frank
(2) Herbicides — sub-committee Chairman, Dr. G. Stephenson
(3) Pesticide Container and Safety — sub-committee Chairman, Dr. G. J. Stopps
(4) Anti-Microbial — subcommittee Chairman, Dr. G. Cooper
(5) Publications — sub-committee Chairman, Mr. K. G. Laver
(6) Legislation — sub-committee Chairman, Mr. K. Turner
(7) Research Assessment — sub-committee Chairman, Dr. R. Harris

Approximately 80 sub-committee meetings were held during the year. In addition to the foregoing functions, the Committee will initiate during 1974-75:-

1. classification of cleansers, deodorants and disinfectants, which are now required to be registered by the Federal Government;
2. a review of and a report on current research projects funded by the Ministry;
3. the selection of future research projects;
4. a one-day seminar on pesticide research;
5. continued co-operation with various Federal and Provincial departments & committees which are concerned with pesticide uses and problems so that the Ministry may be kept informed on all matters concerning pesticides and their use in Ontario.

The Committee held 19 full meetings during the year and activities included the following:-

1. The classification of 323 new pesticide products.
2. Up-dating the classification of active pesticide ingredients.
3. A co-operative review of proposed regulations pertaining to the Pesticides Act, 1973 (Bill 91), with the Ministry's Pesticides Control Service.
4. A continuing review of all pesticide publications produced by the various Ministries of the Ontario Government. To date, 32 publications have been reviewed. The Committee promoted three new publications in 1973:-
   (1) Calendar for Greenhouse Ornamentals — published by OMAF
   (2) Calendar for Nursery Stock — published by OMAF
   (3) Controlling Mosquitoes and Black Flies in Ontario joint publication by OME & NR
5. In the field of research, the Committee compiled a list of priorities which was sent to all research facilities in Ontario inviting proposals for contractual research. 46 proposals, totalling $600,000. were submitted. 14 projects of the highest priority were selected and received grants from the Ministry, totalling $100,000. A sub-committee on research visited all research sites as well as having all researchers present their findings at scheduled Committee meetings. Early in June, 1974 a full report on research granted in 1973 will be forwarded to the Deputy Minister.

WASTE MANAGEMENT

Emphasis continued to be placed on technical advancement of all aspects of solid, waste production, disposal, utilization and treatment. This was stimulated by public reaction on the one hand and growing disposal needs on the other. Studies and research were continued into recycling, reclamation and reuse and into improved physical and operational standards for landfill sites to decrease the potential for pollution.

Through the site and systems appoval procedures, 1768 active waste disposal sites were certified and 1,234 systems. Some 231 sites were closed.

Legislation

Additional regulations under The Environmental Protection Act were registered concerning deep well disposal and derelict motor vehicles.

The deep well disposal regulations limit the amount and types of wastes and the areas and geologic formations into which these wastes may be injected. A fund with contributions based on the quantity and quality of wastes, was established and is on deposit with the Provincial Treasury. It is available as insurance to help renovate any damaged water systems and to support the proper capping and plugging of old unused wells.

The regulation respecting derelict motor vehicles defines and designates derelict motor vehicles as a form of solid waste, and derelict motor vehicle sites as those sites having three or more derelict vehicles. Guidelines for the operation of such sites were established. A system of site certification was initiated in order to develop facilities throughout the Province. Three pilot projects were operated in Thunder Bay, Sault Ste. Marie and Renfrew County to develop additional information on costs and techniques involved in the collection of hulks.

With regard to the regulations covering processed organic wastes, implementation and development of guidelines were instigated. Concern on the part of the agricultural research community resulted in the formation of a committee placing more emphasis on heavy metals, their reactions in the environment, and their migration through the cycle of plant to animal to human and their ultimate effect on the environment and public.

The processed organic waste program involves a comprehensive system for the certification of both haulers and sites in order to maintain maximum control over the application of sludges on land and to maintain a complete monitoring system for both the quality of sludge, the quantity of sludge and the rates of application on various types of soils as well as a monitoring system for the soil and plant characteristics.

Research Grants

Work with respect to the application of sludges and shredded refuse back onto the land continued through research grants with the Universities of Guelph and Waterloo. Through the physical science faculties, valuable information concerning this type of land use activity was obtained.

Research into the application of sewage sludge on mine tailings areas is proceeding. An ongoing study is underway at tailings areas in Sudbury and a field control program through Laurentian University.

Area Planning Studies

Area Planning studies were agressively promoted as a logical approach to the development of comprehensive and environmentally acceptable solid waste programs. Twelve (12) studies were underway. In addition, the Waste Management Branch has urged the development of a public participation phase so that the local residents have an input to the system and dialogue can be established with educational benefits.

It is hoped that the successful implementation of this phase of the program will help preclude the type of opposition that has occurred at hearings held by the Environmental Hearing Board.

Reclamation

Contracts were made with a local engineering consultant for a report on the development of an Experimental Reclamation Plant. Such a plant would not be built as a waste disposal facility but as an experimental processing plant of a modular design approach so that various types of processes, separation, segregations and recoverys can be employed at any point in the process in order to investigate specific phases of solid waste reclamation and reuse.

An "at source" paper segregation program was run in Brampton and Lindsay and the results will be available in the near future. The findings will be used in evaluating the place of this type of approach in an integrated solid waste management system.

Litter

A continuing litter program using SWEEP funds provided needed additional data on the amount, the make-up and sources of litter. Computer storage and handling of data will facilitate its accessibility and use for developing new regulations for various types of packaging as well as developing formulas for the placement and number of litter receptacles.

Energy Recovery

A number of programs were being investigated with respect to energy recovery from refuse.

Reports from the "Watts from Waste" program developed plans to shred and beneficiate refuse and burn the light fraction at the Lakeview Hydro Generating Plant as an auxiliary fuel. Funds have been requested for this with a three-tier approach involving the Ministry, Ontario Hydro and Metropolitan Toronto.

Approaches by the cement industry have been received with respect to the using of shredded refuse in cement kilns. The concept appears to be environmentally acceptable as existing cement plants have stack emission control devices to meet all requirements and the residue obtained from burning the refuse in the kiln will become part of the cement clinker, hence, no solid waste disposal problem would result from this type of approach. The benefication of the refuse prior to burning, would also provide a chance to do ferrous segregation or removal of other valuable material prior to entering the cement kiln.

The technology necessary to make the burning of refuse to produce steam has already been developed and makes this a viable operation. In many cases, the sale of steam has been a major obstacle. Recently the City of Toronto proposed a plant to burn a portion of its refuse and produce steam which would be used in a specified downtown core of Toronto to heat and cool a number of building complexes including the Provincial Parliament Buildings and the hospital complexes on University Avenue. This approach includes an existing steam distribution system which would be an integral part of this project.

This project would involve restrictive building by-laws which would prohibit buildings over a certain size from using sources of heating and cooling (other than non-polluting energy such as electricity) or this particular source of steam.

IJC Activities

Interest in Great Lakes pollution has moved from investigation of point sources of pollution to diffuse sources from various land use activities. Because solid waste and liquids disposed of, or used on land can contribute to this source of pollution the Waste Management Branch has become directly involved in studies to investigate pollution potential resulting from such land use activities as application of processed organic waste on land, operèation of landfill sites and migration of leachate from these sites.

Solid Waste Task Force

A report has been forwarded to the Minister with respect to beverage containers and this will support the development of policy and legislation with respect to packaging. Input from all phases of industry and the community as a whole as well as impact will continue to receive attention.

Environmental Hearing Board

Hearings by the Environmental Hearing Board continued to be a major part of the environmental planning system. As the number of hearings increases, the system is being modified using new guidelines and terms of reference to expedite branch participation.

WATER RESOURCES

Water Quality

The Water Quality Branch is responsible for water quality assessment and provinding recommendations for abatement of pollution. To meet this responsibility the branch conducts surveys on waterways throughout the province, ranging in complexity from the development of comprehensive basin plans to simple assessments for effluent requirements to abate local pollution problems.

Staff with engineering, biology and other scientific skills conduct the surveys and prepare comprehensive reports. These report document the location, nature, and severity of pollution and contain specific recommendations for pollution control measures necessary to restore and maintain water quality needed for water supplies, recreation and aesthetics, fish and wildlife propagation and agriculture.

In support of this work, the branch maintains an inventory of existing water quality, assesses the impact of new developments to prevent the degradation of water resources and operates a laboratory unit to provide biological analysis of samples.

Great Lakes and River Basin Studies

The 1973 Great Lakes program included continued surveillance and monitoring of water quality in the Great Lakes and interconnecting channels and environmental response studies associated with specific waste discharges and confined harbour areas. This includes surveillance of mercury distribution on the St. Clair system and the first field year investigation of pollution in the upper lakes initiated following the signing of the Canada-U.S. Agreement. A number of reports in preparation includes Lake Superior nearshore water quality, Leamington, Wheatley, Thetford, Little River, and others.

Surveillance and Monitoring — Great Lakes

To fulfill Ministry and International Joint Commission requirements for surveillance of water quality in the Great Lakes system, the branch continued synoptic surveys in 1973. Data from this program are used in determining the seasonal, annual or longer term trends which are important in the overall management of Great Lakes water quality.

This information also serves as a basis for assessing the effectiveness of waste control programs such as the initiation of phosphorus removal. Monitoring of the heavily populated and industrialized interconnecting channels provides a measure of the progress of abatement at specific sources and indicates where further control is required to meet the international water quality objectives. When the International Joint Commission's Great Lakes Regional office was opened in Windsor the water quality information summary was supplied to them and incorporated into the Water Quality Board's annual report.

In carrying out the monitoring program on the interconnecting channels, the branch co-operated with the Michigan Water Resources Commission, the U.S. Environmental Protection Agency, and Environment Canada by scheduling surveys to give the broadest time coverage to these waters. Other co-operative programs included data processing and reporting assistance to the Health Units conducting weekly bacteriological sampling of nearshore recreational waters from Burlington to Oshawa.

Numerous requests for water quality data and interpretation from other branches, other ministries, consultants and the public were answered during the year.

In connection with water treatment plant evaluations, phytoplankton samples were analyzed from Wellington, Thunder Bay, Brockville and Bowmanville. Weekly phytoplankton assessments at eight municipalities on lakes Erie and Ontario also continued.

Threshold odor analyses were completed on samples collected in connection with industrial waste studies at Sarnia and Bronte and a taste and odor water supply problem at Thunder Bay.

The distribution and abundance of algae in Lake Ontario was studied to provide photo-interpretive data for remote sensing techniques in assessing plant growths. A bioassay on the filamentous green algal Cladophora was also undertaken.

Surveillance and Monitoring — Inland Streams and Lakes

The monitoring program provides information on water quality throughout the province. The information collected through this program provides a basis for establishing the seasonal and long-term trends in water quality, assists in the definition of waste discharge restrictions and the enforcement of pollution control.

On the average, 14-15 runs were carried out at 750 locations on inland watercourses. As part of the International Joint Commission Upper Great Lakes Study, sampling was expanded by about 100 stations to include all significant river basins draining to Lake Superior, the North Channel of Lake Huron and Georgian Bay.

Recreational Lakes Program

As part of the Recreational Lakes Program, contributions were made to 25 lake reports. Approximately

90 lakes have been assessed under the Program to date. The greatest majority of lakes studied have not demonstrated significant water quality problems.

Hamilton, Thunder Bay, Toronto and Other Studies

The major activity has been the evolution of nearshore and harbor water quality models which have predictive capability. These models vary in the approach and results obtained. Statistical and stochastic models are developed from routine and intense water quality survey data (water chemistry, biological, bottom sediment and fish studies) gathered by Ministry staff or others to predict trends and evolve cause and effect relationships.

Numerical models are based upon data collected from chemical and physical recording instruments operated in the harbour entrances and at other harbour locations. These models consider existing shore geometry, discharges, intakes and lake exchanges which can then be varied to determine water quality implications of changes.

Process models examine chemical balances such as dissolved oxygen and nutrients and determine how the discharged chemical quantities are being utilized, e.g. sedimentation, biological absorption, reaction, exchange to lake, etc. A combination of these models provides an understanding of the harbour kinetics and provides a basis to estimate the effects of changes. A report integrating the predictive models for Hamilton Harbour will be released in May 1974. This report recommends steps for for water quality enhancement.

A report on Thunder Bay, estimating the coastal-offshore exchange rates of discharged phosphorus, was also released. Work continues in the three harbours. The effects of thermal waste discharges continued to be monitored in the vicinity of the Nanticoke, Douglas Point and Pickering thermal generating stations.

Drainage Basin Studies

Major drainage basin studies were carried out in the Kawartha-Trent and Lake Simcoe areas, the Thames River and in the Sudbury area. Various water quality investigations, which vary widely in intensity, purpose and scope, were carried out by staff of the Water Quality Branch.

Upper Great Lakes Investigations

In 1973 Ontario began an intensive three-year assessment of existing water quality conditions in the Upper Great Lakes under the International Joint Commission reference of April 1972 established with the signing of the Canada-United States Agreement on Great Lakes Quality. The Ontario Ministry of the Environment is co-operating in these large scale investigations with other provincial agencies, and agencies of the Canadian federal and U.S. federal and State governments.

During the year the Branch conducted nearshore monitoring of water quality in Lake Superior as well as intensive studies of localized areas in both Lake Superior and Lake Huron where urban and industrial development is contributing to significant impairment of the water and biota. Some of the major areas of intensive study were Thunder Bay, Marathon, the St. Marys River and Penetang and Midland Bays. Reports on these and other studies are in preparation for Ministry publication and also for incorporation in the final Upper Lakes report expected in December 1975.

Ministry expenditures under this study program in 1973 were some $510,000, and it is projected that spending in 1974/75 and 1975/76 will amount to $590,000 and $570,000 respectively.

Laboratory Toxicity Studies

A new toxicity laboratory was established and much of the year was devoted to installation development, evaluation of new equipment to enable the performance of controlled lethal and sub-lethal toxicity testing. Of particular interest is the development of a physiographic system for the measurement of fish respiration rates under constant flow conditions in the presence of toxic materials.

Work continued on the significance of ammonia in refinery effluents in relation to the survival of fish species. In addition, techniques for the maintenance and culture of several new bioassay test species were investigated.

Mercury

In connection with possible litigation procedures, a one year study investigating the concentrations and distribution of organic and inorganic mercury in Lake St. Clair sediments, plants, small fishes and aquatic animals relative to conditions in Lakes Huron, Ontario, Rice and Simcoe was completed. Collection of selected Lake St. Clair Walleye and Perch were obtained in collaboration with staff of the Ministry of Natural Resources to assess annual trends in mercury contect in fish muscle. In addition major surveys of mercury levels in sport fishes from the Kapuskasing, Ottawa and St. Lawrence Rivers were completed.

Kawartha Lakes Water Management Study

In 1971 a co-operative study involving staff of the Ministry of the Environment and Ministry of Natural Resources was initiated on the Kawartha Trent System betwen Balsam Lake and the Bay of Quinte. Efforts to date have included complete assessments of water quality throughout the system, the establishment of nutrient budgets and patterns of water resource utilization and an aerial photographic survey to establish the extent of aquatic plant growths. As part of the study, a large-scale program to mechanically harvest aquatic vegetation and to assess the techniques as a potential water management tool for enhancing and/or improving the lake environ was initiated in the southern end of Chemung Lake. Studies to assess the impact of harvesting on water quality, phytoplankton and zooplankton stocks and production rates as well as an evaluation of angling success in clear and untouched areas of the lake were initiated.

Detailed investigations designed to monitor changes in plant populations and to establish optimum cutting procedures, seasonal changes and rates of re-growth were also undertaken. During 1974 considerable efforts will be expended to investigate potential uses and methods of recycling the harvested crop.

Lake Simcoe Study

The Lake Simcoe Water Quality Study was initiated in 1970 and intensified during 1971 and 1972. Further water quality monitoring was carried out at key locations

throughout the lake and at the mouths of the tributary streams, as well as minor studies, to complement field work initiated in previous years.

Preparation of the report, which will contain recommendations designed to formulate a water quality management plan for the Lake Simcoe basin was initiated in 1973. A technical report will be published in mid-1974 followed by a non-technical version for public distribution to all interested Lake Simcoe cottagers and other concerned citizens.

Thames River Basin Study

The Thames River Basin Study was initiated in 1970 in response to the growing concern over existing water quality conditions and the potential further deterioration resulting from increased population growth and future economic development.

The study will lead to the development of guidelines for management of the basin's water resources to ensure that adequate quantities of water of satisfactory quality are available for the recognized uses. Erosion control and flood protection within the context of the water quality of this resource will be reviewed consistent with appropriate benefit-cost criteria.

A research program to define the quantitative relationships between nutrient and biomass was also initiated. Mathematical models are being developed to aid in the analysis of data and assessment of planning alternatives. A consultation program was also designed to obtain information from the public on the management of the basin's water resources.

During 1973, the ongoing survey programs were completed. The findings of these studies, together with information obtained from the public consultation program will be incorporated in the final report. An interim report was released for public discussion following which recommendations will be completed for inclusion in the final report.

Sudbury Environmental Study

The Sudbury Environmental Study has as its basic objective the establishment of a cause and effect relationship between atmospheric contaminants, deteriorating water quality and declining fish populations in the Sudbury area, and how to restore acceptable water quality conditions.

Involvement in the study continued on three separate fronts. The first approach related to extensive water quality assessments of four lakes located at varying distances and directions from the industrial smelting complex at Sudbury and under different geological formations and surficial soil conditions. The second avenue related to toxicity studies. A mobile laboratory was located at Lake Panache to perform preliminary tests with the American flagfish to evaluate its suitability in assessing the reproductive effects of acid waters which are scheduled to be carried out in 1974. The final avenue involved lakescale assessments of the effects and drawbacks of various chemical additives which may be used to restore poorly buffered lakes in the Sudbury area which have been contaminated by emissions from smelting stacks.

Assessment and Restoration

Studies were carried out in Gravenhurst Bay of Lake Muskoka and in Little Otter Lake north of Parry Sound to assess the effects of phosphorus removal in halting or reversing the process of eutrophication. On the basis of the available data it is encouraging that water quality improvements have materialized in both systems, based on chemical and biological responses. In the Bay of Quinte a co-operative venture, involving staff of the Ministry of Natural Resources and the Canada Centre for Inland Waters were continued to assess current water quality conditions in light of future changes which hopefully will materialize following phosphorus removal at local sewage treatment plants. A study to evaluate the effects of phosphorus complexing chemicals when added to enriched waters was carried out in a farm pond north of Metropolitan Toronto. Investigations to evaluate the destratification experiment in Buchanan Lake near Dorset to improve the ecology for deep-water fish species, as well as the aeration of Thompson Lake near Maple, and Valens and Scotch Block Reservoirs near Guelph to improve water quality.

Dredging and Marine Construction

All aspects of marine construction, including dredging, piers, landfills, canals, bridges, submerged pipelines and utility conduits, shore protection structures and marine mining, are evaluated for their impact on water quality.

In 1973-74, 314 proposals were evaluated, compared to 222 in 1972-73. Recommendations are made on these project to prevent degradation of water quality and to avoid interference with other water users. Field studies are undertaken to verify the effect of various projects and to assess compliance with recommendations.

Environmental Impact Assessments

Forty-five statements concerning the impact of various projects such as highways, reservoirs, dams, aggregate pits and electric power transmission line crossings, as well as 63 proposals for effluent discharges were examined for compliance with the Guidelines and Criteria for Water Quality Management in Ontario.

Water quality standards for river basins are being developed and referenced for the determination of permissible waste loadings. In the process of establishing water quality standards and effluent requirements, it becomes necessary to define mixing zones in the vicinity of waste discharges.

Water Quantity

The Water Quantity Management Branch is responsible for the inventory, assessment and management of surface and ground water resources with respect to quantity, and also for the protection of ground-water quality. The programs are carried forward through four sections and include the collection, analysis and publication of basic hydrometric and hydrologic data, the assessment of water resources through surveys and interpretation, the development of water supplies by test-drilling and well-construction projects, the management of resource use through a water-permit system, the regulation of the water-well industry, and scientific hydrologic studies. The programs include regulatory, planning and inventory assignments.

The Branch had a complement of 97 and a budget of $2,000,000.

Specific attention is directed to the activities associated with the Grand River Ground Water Recharge Studies and to the International Reference Group on Great Lakes Pollution from Land Use Activities for the International Joint Commission on Boundary Waters.

Pollution From Land Use Activities

To meet the requirements of the International Joint Commission, representatives contributed to the development of a study plan for the Investigation of Great Lakes Pollution from Land Use Activities. The plan was approved by the International Reference Group and submitted to the IJC and its Water Quality Board. Implementation involves a number of Ministries in Ontario as well as federal and American agencies and arrangements were made for the necessary resources.

Grand River Implementation Committee

The Grand River Implementation Committee is responsible for the studies recommended in the Grand River Planning Report. It has representation from the ministries of Natural Resources and Environment, the Grand River Conservation Authority and Management Board of Cabinet. In addition to co-ordinating the component studies, the Committee participated in seven public and council meetings to provide information on the program and its progress and to obtain local opinions.

Grand River Recharge Study -

The study initiated in 1972 to determine the feasibility of recharging Nith River water through the ground as a method of water supply for the Regional Municipality of Waterloo was continued into the 1973/74 fiscal year with a budget of $200,000. The main purpose of the study during the year was to determine the geologic economic feasibility of artificial ground-water recharge in four general areas defined by the previous year's work. The field work was carried out by Hydrology Consultants Ltd. of Mississauga and consisted of test drilling for geologic information monitoring water levels in piezometers and of hydraulic testing of permeable formations. A three-week infiltration test in a small recharge basin concluded the field work late in December. As a result of the year's work, recharge appears feasible at Roseville and in the vicinity of Mannheim but the economics of the scheme have not yet been fully determined.

An extensive program of surface and ground-water quality monitoring was carried out by section personnel and the results are being evaluated to determine potential water quality problems associated with recharge.

A Ministry report to the Regional Municipality of Waterloo regarding the project was planned for presentation in May.

Northern Ontario Water Resources Studies

The Northern Ontario Water Resources Studies comprise a preliminary assessment of the water resources in the river basins draining to James and Hudson bays. The objectives of the study are to assess the quantity and quality of the surface and ground-water resources and to determine present and future requirements for such waters and to publish the findings in 1974. While some field work continued, emphasis was placed on the interpretive and reporting aspects of the study.

Drainage Basin Studies

Studies to assess the availability surface and ground-water resources were continued primarily in the Thames River Basin in support of an integrated water management plan. A draft report of the surface water resources of the Thames River Basin was completed. The ground-water portion was incompleted. Interim reports on surface and ground-water resources were completed and submitted for publication. In addition, a detailed assessment of water takings and water-use conflicts was compiled.

Staff also participated in a public consultation program to obtain the public's viewpoint through meetings with interest groups and municipal officials, and by means of a questionnaire. A staff member participated in preparing an interim report, planning a series of public meetings to discuss the findings to date, and co-ordinated the branch contribution to the overall study.

A draft of the report "Water Resources of the Moira River Drainage Basin" was completed and was under review.

The Duffin-Rouge Basin study was resurrected with emphasis on ground-water evaluation work in the vicinity of the proposed Pickering airport and townsite. Approximately $10,000 was spent this year on test drilling and observation well construction.

Municipal Ground Water Surveys

Fourteen surveys were undertaken to evaluate the feasibility of utilizing ground-water resources for municipal water supply purposes. Eleven reports were

released and three studies were in progress. Most of the surveys were for proposed Ministry water works projects. Follow-up work in the form of test drilling was recommended in instances where conditions appeared to be favourable.

Test Drilling and Well Construction Projects

Test drilling projects to evaluate precisely the availability of ground-water resources for municipal water works systems were in progress at 15 communities. Construction projects to install production wells were undertaken at nine communities. A total of 24 projects were handled during the year.

Test drilling resulted in the location of suitable ground water supplies at Elk Lake, Markdale, Lansdowne, Creemore, Arkona and Mount Brydges. Production wells were constructed at Baden, and Frankford, and construction was underway at Port Perry and Courtland.

Special Water Supply Investigations

Forty-one special investigations relating to ground water supply problems and well performance were carried out. Twenty-six of the investigations involved testing ministry-owned wells to determine operating efficiency and productivity and recommending rehabilitative action. The remainder of the investigations involved opinions to municipalities or consultants on securing ground-water supplies. Comments were presented on a large number of design reports for sewage and water works projects.

Ground Water Pollution Control

Two hundred and sixty-five investigations into existing or potential ground-water pollution problems were handled during the year. Two hundred and twenty-six reports were released and 39 investigations were in progress at the end of the year. Seventy-two of the investigations were associated with petroleum product spills or leaks, 43 with proposed sanitary landfill operations and 25 with proposed sewage lagoons. Four proposals involving deep well injection of liquid wastes were reviewed. One hundred and twenty-one investigations involved ground-water pollution originating from a variety of sources such as waste disposal sites, sewage lagoons, septic tanks and road-salt spreading and storage.

Advice was provided on sources of pollution, remedial or preventative measures and methods for restoring or obtaining alternative water supplies.

Permits To Take Water

Five hundred and forty-nine Permits To Take Water were issued for the following purposes: commercial 17; industrial 115; irrigational 275; municipal 58; recreational 84. The permits were grouped by source as follows: surface water 429; ground water 101; combined 19. Two hundred and one permits were cancelled and 803 were renewed. In addition, 59 Letters of Approval were issued to authorize test pumping.

At the end of March, 1974, 5,278 permits were in effect, authorizing a maximum total taking of 13.3 billion gallons per day. Fifty-one detailed pre-permit investigations were carried out to evaluate the potential for interference, so that appropriate terms and conditions could be applied.

Water Supply Interference

Seventy ground-water and 17 surface-water interference investigations were investigated and appropriate action taken. The problems were grouped according to cause as follows: municipal takings 25; pit or quarry operation 14; road, ditch, sewer, or watermain installation 12; improper operation of dams 11; irrigation takings 11; miscellaneous 14. Several complaints of streamflow interference against a commercial sod irrigator were investigated. The firm was successfully prosecuted on two charges under Section 37 of The Ontario Water Resources Act for failure to comply with the terms and conditions of its water permit, and fined $300. Other significant studies involved the resolution of claims of well interference due to quarry dewatering in the Township of Anderdon, a subdivision well operation near Unionville, and municipal-well operation in the Towns of Newmarket and Orangeville.

Well Construction Management

Water-well contractors and well-construction practices are regulated to ensure the installation of safe water wells and to protect ground-water quality. One hundred and thirty-eight licences for 1973, and 367 licences for 1974 were issued to water-well contractors. Records for 14,388 wells were received. The inspectors visited well contractors on 1,191 occasions, inspected 1,491 wells for sanitary construction and checked the location of 11,259 wells. Thirty-one investigations were made concerning water-well regulations.

A charge was laid under Ontario Regulation 648/70 for violation involving the use of a well pit which allowed the entry of surface water into a well. A fine of $300 was imposed.

Environmental and Use Evaluations

A staff member participated in a working group for the Upper Great Lakes Study to provide the International Joint Commission and the Ministry with information on existing conditions of population, settlement patterns, land use and water use. Nine other water-use studies for specific watersheds were completed. Staff carried out or contributed to 49 environmental evaluations. This involved reviews of proposed pits and quarries, roads, pipelines, hydro corridors, and official plans.

Geocoding

Hydrologic coding of all streams and rivers in the Province using the STORET system was completed. Other STORET coding was completed for all municipal treatment works in the Province, 65 industrial waste outfalls and 16 Geocode models for the Ministry of Transportation and Communications.

Streamflow Data

Streamflow data were assembled through the operation of gauging stations and through co-operative arrangements with the Water Survey of Canada.

The number of stations operated in the regular streamflow measurement program was increased from 98 to 112 to meet increased demand for data. Daily records were collected for the full year at 12 stations (recorders) and for the summer or open-water season at 16 stations (12 recorders and 4 gauge readers); flow measurements were made at 84 other stations to maintain or develop rating curves. Control structures

were installed at three sites, Colborne Creek, Centennial Creek and Cobbs Lake Creek to meet the requirements of other branches or agencies. In addition, fifty sites were monitored for summer flows, 42 were sites monitored the previous year and eight were new sites.

The Water Survey of Canada increased the number of streamflow gauging stations which it operates under a cost-sharing agreement from 89 to 97 and continued to operate five lake gauges in the Hudson Bay drainage basin under the same agreement.

Streamflow data gathered during 1972 was published in Water Resources Bulletin 3-7. Bulletin 3-8 containing data gathered in 1973 assembled ready for publication. Daily records for 16 recording stations operated during 1972 were assembled and forwarded to the Water Survey of Canada for inclusion in their annual publication "Surface Water Data—Ontario".

The map "Low-Flow Characteristics of Streams in the Toronto-Centred Region" was published. It is a statistical analysis of low flow data for stations on streams within the boundaries of the Toronto-Centered Region. Most of the requests for streamflow data came from other Branches, Ministries and Civil Engineering Consultants, but an increasing number of requests for information on water levels and regulation of inland lakes and waterways were received from cottage owners and marina operators during the late summer and early fall.

Low flow analysis, high flow analysis or assessment of water availability were made for 11 streams in response to requests for data analysis. Information and results supplied were accompanied by explanatory texts varying from simple letters to comprehensive reports.

Digitizing equipment improved and accelerated the processing of analog charts to digital form for computer processing.

Staff have been involved in establishing a network of stations to meet the requirements for specific studies. Inspections were made at 22 proposed gauging stations in the proposed Pickering Airport and Townsite and proposals have been made to install and operate several streamflow and sediment sampling stations at 11 lakes in the Sudbury area to assist the Water Quality Branch in an environmental study of lakes in the area and in a Lake Restoration Program. Staff made a brief assessment of the effect of the application by the City of Winnipeg to increase its water taking from the Lake of the Woods. Meetings were attended with the Federal Government to discuss changes in the cost sharing arrangements for the federal/provincial co-operative hydrometric network.

Hydrogeological Data

The observation well network consisted of 217 wells, Twelve new wells were established and six wells in southern Ontario and 32 wells in northern Ontario were discontinued as observation wells. The number of recording wells increased by 12, from 96 to 108.

About 11,200 water-well records received from water-well contractors, were placed on open file. About 11,000 well locations from the inspectors' maps were transferred to the permanent well location maps. The conversion of the Ontario water-well records to an EDP system allowed the development of computer programs to manipulate and plot hydrogeological data for use in geologic studies and ground-water supply investigations.

As a result of public enquiries, 128 letters were written, about 2,400 copies of well records were made available to private citizens, consulting engineers, university researchers, and others interested in locating and developing ground-water or in assessing ground-water resources. One hundred and twenty-five visitors consulted the records or discussed ground-water conditions with staff members. About 650 enquiries were answered by telephone. Fifty-four requests for computer print-outs and well locations maps were provided to governmental and municpal agencies, and to universities and consulting engineers.

Water Resources Bulletin 2-13 was published and Bulletins 2-12 and 2-14 were at the printers.

Ground Water Assessment

The manuscript of Water Resources Paper 6 "Aquifer Characteristics of the Guelph and Amabel Formations in the Township of Sullivan, County of Grey" was prepared for publication and the draft of Water Resources Paper 8 "Aquifer Characteristics of the Shallow Overburden in the Township of Colchester South" was completed for review.

For the ground-water assessment project in the Township of Morris, a 24-hour pumping test was carried out to give more data on the hydraulic characteristics of the Detroit River Group of rock formations.

Manuscripts of Ground Water Probability maps for the counties of Haldimand, Brant and Middlesex have been prepared for publication.

Scientific Hydrologic Studies

The scientific hydrologic studies of five representative drainage basins in southern Ontario, including a watershed response model formulation and implementation were continued. Ground-water inflow studies were also completed under the International Field Year on the Great Lakes (IFYGL) program, thereby comprising a substantial portion of the Ministry's contribution to the International Hydrological Decade (IHD) program.

Other specialized work included the application of hydrologic modelling routines to the Thames River Water management study, ground geophysical surveys, geophysical well logging and soils laboratory studies to support geological field investigations and ground-water supply projects. Remote sensing studies evolved and were evaluated as to their suitability in water resources assessment programs.

WATER SUPPLY AND POLLUTION CONTROL

Industrial Wastes

The Industrial Wastes Branch is responsible for the control and regulation of liquid industrial wastes in Ontario as decreed under the Ontario Water Resources Act and the Environmental Protection Act. Branch activities include surveys of all industrial sources of liquid wastes discharged to the aquatic environment, assessments of the status of pollution control at each plant and recommendations on remedial measures where required.

An extensive surveillance program is maintained throughout the province, legal enforcement measures such as prosecutions and orders are initiated in cases of gross violation, and engineering plans for waste treatment facilities are reviewed for approval. Co-operative programs are worked out with municipalities for the regulation of industrial waste discharges into municipal sewers and a variety of specialized advisory services are available to individual companies or major industrial groups to assist in the resolution of problems.

During the year, emphasis was continued on improving procedures for investigating public complaints, on improving the spill prevention program, and on improving responses to spills of hazardous materials. An automated data processing system was designed to process all pertinent data on industries and the wastes they generate. The system has been tested on selected industries and is expected to be fully operational in 1974.

With the exception of the pulp and paper industry, most major industries continued to implement approved abatement programs. Some progress was made with the installation of facilities to control suspended solids discharges in the pulp and paper industry but effluent quality is still far from Ministry objectives in most cases.

The activities of some of the major industrial categories are highlighted below.

Basic Iron and Steel

The Steel Company of Canada Limited continued work on the program to recycle blast furnace wastes. The company plans to use indirect coolers which will be the first such system in a steel mill. Recycle on one blast furnace is expected by mid-1974 and on the remaining furnaces by 1975.

An ion exchange system to remove chromium from the electrolytic tin plating lines was placed into operation during 1973.

Dominion Foundries and Steel Limited, Hamilton continued construction on the waste treatment complex to serve the cold mill. The complex will include facilities for the treatment of soluble oil, ion exchange, treatment of batch discharges, and treatment of reuse waters. The oil treatment section is scheduled for start-up in early 1974 and the remainder of the complex is expected to be operational by the end of 1974.

A project to segregate clean and dirty wastes from each blast furnace is underway and is scheduled for completion by mid-1975. Also, investigations into cyanide control, with and without recycle, are being conducted. Partial recycle could be operational by the end of 1975 with complete recycle by the end of 1976.

Some mechanical problems have been experienced with the high-rate, deep bed filtration plant used to treat hot mill wastes. These problems are expected to be resolved in 1974.

A major mill expansion is planned at the Algoma Steel Corporation Limited in Sault Ste. Marie. As part of the expansion, a new coke oven will be built that will incorporate the latest technology including indirect gas cooling and ammonia removal.

The company plans to treat wastes from the coke quench by the end of 1975. In the cold mills, construction of the facilities to segregate wastes and to remove oil and suspended solids is proceeding and is expected to be complete by the end of 1974.

Petroleum and Petrochemical

The shortage of crude oil in Eastern Canada resulted in an increase in crude oil refining in Ontario and in the shipment of crude oil from Ontario refineries, via the St. Lawrence Seaway, to Montreal. These increases in production were accomplished with little degradation of effluent quality. Inadequate facilities to handle ballast waters from the large tankers used to transport crude oil were encountered. These problems have been resolved for the 1974 shipping season with the co-operation of the refineries.

Texaco Canada Limited is proposing to construct a major oil refining complex at Nanticoke, on Lake Erie. The refinery will include the most advanced waste treatment technology to meet the stringent effluent requirements of the Ministry for an oil refinery at that location.

A large olefins and aromatics manufacturing facility is to be constructed in the Sarnia area. This project known as the Sarnia Olefins and Aromatics Project (SOAP) is a joint venture with Polysar Limited and DuPont of Canada Limited being the principals. The total cost of the project, which will include extensive waste controls to meet the Ministry's requirements for discharge to the St. Clair River, will be in excess of $14.5 million.

Regulations and Guidelines for the petroleum refining industry were promulgated by the Federal Government in late 1973. These regulations and guidelines were developed in co-operation with the provinces and industry.

Food Processing

By the end of 1973, all food processing plants and

related industries in Ontario had implemented acceptable effluent control programs and installed the necessary treatment facilities to handle their wastes. Outstanding problems are the result of spills and upsets rather than the lack of treatment facilities.

The disposal of whey from the cheese manufacturing industry has been a long-standing problem. Recently, with the increase in cost for protein sources, the economics of whey drying have improved. An application has been submitted to the Ontario Development Corporation for a grant to assist in the construction of a central drying plant in the Kingston area.

Mining and Metallurgical

There are over 100 active mining operations in the province.

Towards the end of 1973, "Effluent Guidelines and Receiving Water Quality Objectives for the Mining Industry in Ontario" were issued by the Ministry. At the end of 1973, most mining operations were in compliance with the Ministry's guidelines with respect to pH, suspended solids, and the common heavy metals. Lack of waste treatment technology has prevented compliance with the guideline for ammonia, one main source of which is the ammonia-based explosives used at most mines.

No major failings of tailings dams were experienced in the Province during 1973. This reflects the value of the Ministry's strict requirements for the construction of such dams.

During 1973, the Ministry initiated a program of waste water recycle in the mining industry. By the end of the year, a total of six mining operations were reusing tailings area decant water in their respective mills. Commitments have been received from three additional mines to implement waste water recycle. Waste water re-use is carried out extensively in the eight iron ore operations in the Province.

A program has been initiated to resolve the problems of the gold mining industry. Waste water treatment technology is not sufficiently advanced in this industry to effect control of discharges of cyanide, copper, zinc and arsenic and, consequently, all of the gold mining operations failed to meet the Ministry's guidelines.

Work has continued on the preparation of Federal Regulations and Guidelines for the Mining Industry. Ontario has made a significant contribution to this task and the final regulations and guidelines are expected to be promulgated in the fall of 1974.

Pulp and Paper

Progress continues to be made in the reduction of suspended solids discharges. During 1973, one mechanical clarification system was completed and construction commenced on calrification systems at two mills and a dissolved-air flotation system at a third mill. These three systems are expected to become operational during 1974. In addition, the Ministry has approved the designs of a mechanical clarification system and a dissolved-air flotation system to be constructed during 1974 at two other mills.

When construction of these facilities is complete, suspended solids control facilities will be operational at all large pulp and paper installations in the province. There will only remain four mills without treatment facilities. One of these mills is committed to install a spent liquor incineration system and will not require suspended solids removal facilities. The remaining three mills are relatively small operations and each one has been actively engaged in trying to find an economic solution to its particular problem.

Although the installation of facilities for the removal of suspended solids will have removed substantial quantities of these materials from the mill discharges, few mills are meeting or will meet the Ministry's interim requirement of 50 mg/1. Continuing efforts on the part of the industry and the Ministry will be required to effect further reductions.

Reduction of BOD associated with mill discharges had been negligible. A spent sulphur liquor chemical recovery system is under construction at the Thorold mill of the Ontario Paper Company Limited and is expected to reduce the BOD by up to 100,000 pounds per day, producing a salt cake by-product which will be sold to kraft mills for chemical make up.

A number of bench and pilot plant studies into the biological oxidation of spent sulphite pulping liquors have been conducted. In no case has the system proven completely successful and the Ministry is doubtful whether this route will offer a feasible solution to the problem. However, work is continuing at one mill with a pilot aerated lagoon.

Pilot studies have been conducted on the biological oxidation of kraft mill wastes. In most cases, these were necessary to determine design parameters. Of note was a study conducted by Environment Canada in co-operation with the Ministry on the treatment of kraft mill condensates and combined bleach plant effluent by the Attisholz Process. This process appears to work well, can resist shock loadings better than a single stage system and is efficient. However, biological oxidation alone does not appear to reduce toxicity to the level required by the federal regulations. The facultative aerated lagoon appears to offer the best possibilities but this type of system can have secondary problems.

Condensate stripping systems are under construction at two kraft mills in the province. These systems are expected to reduce the taste, odour, toxicity and fish tainting potential associated with kraft mill discharges. When these systems are in operation, the Ministry will undertake an evaluation of the remaining mill discharges to determine the need for additional treatment.

The aerated lagoon system installed to treat the wastes from the new kraft mill at Fort Frances (which commenced operations at the end of 1971) continues to be plagued with problems. Fifty per cent more aerator capacity has been purchased but installation was delayed by a mill strike during the Summer and Fall of 1973. These aerators will be installed as soon as possible in 1974 and it is hoped that the lagoon will then begin to function as an efficient waste treatment facility.

As an economic stimulus and a potential solution to the problems of disposing of sulphite pulping liquors, a number of pulp and paper companies are looking at the replacement of sulphite pulps by mechanically refined pulps. In Ontario, two mills have announced plans to install a 200 ton per day and a 100 ton per day, respectively, pilot mechanical refining unit. If these projects prove successful, the companies in question plan to phase out their sulphite pumping operations.

A number of new mills and major expansions have been announced for the industry in Ontario:

1) A new 750 ton per day kraft mill at Thunder Bay by the Great Lakes Paper Company Limited.
2) A 120 ton per day expansion of the existing kraft mill at Dryden and the construction of a forest products complex, including a 750 ton per day new kraft mill in the Red Lake area by the Dryden Paper Company Limited
3) Two new particle board mills:
   —Domtar, Huntsville
   —Weldwood, Longlac
4) Two new waterboard mills:
   —Great Lakes Paper, Thunder Bay
   —Macmillan Bloedel, Thunder Bay

Electrical Energy

Thermal effects on the aquatic environment of the discharges of large amounts of condenser cooling waters from electrical power generating stations continue to be actively studied. Baseline data are being collected at several locations such as Nanticoke, Lennox and Pickering

In 1973, a pre-operational Report On Nanticoke was issued which documents the conditions in the aquatic environment in Long Point Bay, Lake Erie from 1967-1971.

Concern has arisen that the use of once-through cooling at the generating stations proposed to be constructed on Lake Ontario could adversely affect the eco-system of the Lake. In order to determine the studies necessary to ensure that adequate data are avilable to make the necessary decisions relating to cooling water, a task force has been established. Also, a short-term study into alternative methods of once-through cooling is planned for 1974.

Thermal effects related to electrical power generation are no longer the only concerns. Added factors, such as the entrainment of fish and aquatic organisms in cooling water intakes and the effects of the siting of a generating station on the local environment now require much more study. Even though the Ministry does not yet formally require environmental impact assessments for major projects, Ontario Hydro has submitted environmental assessments for a proposed new generating station at Wesleyville and for doubling the capacity of the station at Pickering. In both cases, public meetings were held to obtain public input to the decision-making processes.

The Ministry is interested in the releases of radio active materials from nuclear generating stations even though this segment of the industry is regulated by the Atomic Energy Control Board. An external consultant has been retained to determine the extent to which the Ministry should become involved and to estimate the manpower, materials and budgetary requirements needed to establish a program. The consultant's report is expected to be available in the Spring of 1974.

Ministy representatives participated in a Task Force of the Advisory Committee on Energy which issued a report, "The Impact of Energy Use on the Environment". The report is a comprehensive documentation of the environmental effects accompanying the production, transmission and utilization of energy.

Metal Finishing and Plating Industry

All metal finishing and plating plants in Ontario which discharge wastewaters to natural watercourses have installed facilities capable of treating their wastewaters to levels in compliance with current Ministry objectives.

Regulations and Guidelines for the metal finishing and plating Industry are being developed currently by Environment Canada. A questionnaire designed to assess the extent and nature of existing controls and the waste loadings contributed by various processes was used to survey the industry. The Ministry co-operated in the Ontario part of this survey and is expected to participate in a Task Force which will be established to review the findings of the survey and to develop the regulations and guidelines.

Approval of New Treatment Facilities

Section 42 of the Ontario Water Resources Act requires industries to submit applications to the Ministry for the approval of plans for the collection, transmission, treatment and disposal of liquid industrial wastes. Applications are reviewed and, if found satisfactory, certificates of approval are issued.

Prior to approval, a public hearing may be held under the terms of Section 43 or 44 of the OWR Act. Hearings are mandatory if the treatment works are to extend across municipal boundaries and are held on an optional basis where the Ministry considers it in the public interest to hold such a hearing.

During the 1973/1974 fiscal year, 75 certificates of approval were issued for individual treatment works involving estimated total expenditures of $51.3 million. In addition, 22 other submissions were given concurrences involving an estimated capital cost of $2.7 million. These latter facilities were not subject to Section 42 of the OWR Act as they were classed as inplant process control measures, non-effluent systems involving wastewater reuse, or pretreatment systems with discharges to municipal sewage treatment plants.

As of March 31, 1974, 30 applications were outstanding involving an estimated projected expenditure of $16.3 million.

Since 1965, when the approval program was initiated, 801 certificates have been issued for industrial treatment and control works involving an estimated cost to industry of $202 million.

In accordance with the terms of the Pollution Abatement Incentive Act, 1970, applications from industry for grants up to the equivalent of the provincial retail sales tax on equipment installed for purposes of pollution abatement are reviewed and recommendations made to the Ministry of Consumer and Corporate Affairs. During the 1973/1974 fiscal year, recommendations were made for grants totalling approximately $330,000 regarding 82 applications.

Contingency Planning and Prevention and Control of Spills of Hazardous Materials

During 1973, approximately 700 spill incidents were reported to the Ministry. In addition, approximately 180 complaints were received. Of the 700 spill incidents, 507 were reported which involved the loss of petroleum products. Available information indicated the loss of 576,000 gallons of products from only 275 of these incidents. Eleven of the spills were classified as major incidents and included three oil pipeline ruptures, accounting for the loss of 80,000 gallons of light oils, and one train derailment which resulted in the loss of

60,000 gallons of bunker oil and 60 tons of caustic soda

Of the total number of spills reported in the province during 1973, equipment failure and negligence may be singled out as the two main causes. Reporting of traffic accidents has increased and it is apparent that a much greater effort must be devoted to spill prevention.

Considerable progress has been made in the area of contingency planning at all levels of government. A joint Canada-U.S. Plan was finalized and as part of this plan, the Ontario Ministry of the Environment has accepted major roles and responsibilities in incidents affecting Ontario. With respect to the Ontario Contingency Plan, a status report, "The Province of Ontario Contingency Plan for Spills of Oil and Other Hazardous Materials, Status Report May 1973", was published. This report summarized and updated the 1971 Interim Plan and advocated major changes in some of the concepts contained in the Interim Plan.

Encouraged by the Ministry, several of the largest municipalities have prepared or initiated steps to prepare municipal contingency plans. These plans are necessary to fill the wide gap which often exists between industry plans and the Provincial Contingency Plan.

In two incidents, when the parties involved failed to respond to Ministry directives to clean up, the Ministry hired contractors to perform the necessary work. In one of these cases, the Ministry was able to recover costs when the responsibility of the spill was established.

Future concerns of the Ministry include the establishment of eight additional regional response teams in spill-sensitive, high-risk areas and a workshop to be held in 1974 under the joint sponsorship of Ontario and Environment Canada. This workshop will assist persons involved in contingency planning to better understand the complexities and roles of various governmental agencies and the commitments of various agencies under international, national, provincial, local or other plans and agreements.

Industrial Pollution Control in Municipalities

Liaison on the control of industrial waste continues to be maintained through the Municipal Engineers Association — Ministry of the Environment Liaison Committee.

A sub-committee, under the chairmanship of a staff member of the Industrial Wastes Branch, was established to review the content of the "model by-law" and to recommend changes in light of present day needs. The Ministry encourages all municipalities to enact a by-law for the control of industrial waste discharges into municipal sewerage systems. Uniformity of control across the province would be beneficial in that it would result in the reduction of materials discharged to sewers and encourage the concept of reuse of materials. Although the province has no direct jurisdiction over municipal sewer systems, the Municipal Engineers Association can assist greatly in promoting the use of a model by-law which has the support of the association and the Province.

A course, "The Control of Industrial Wastes in Municipalities" was offered again to municipal employees and any other interested parties, in the fall of 1973. The course was substantially revised from previous presentations with emphasis placed on student participation as opposed to the conventional "lecture series". In addition, visits were made to a number of industries with waste problems so that first-hand experience could be gained.

This year, for the first time, it was decided to issue a certificate for successful completion of the course. Sixty-six persons attended the course and 58 subsequently received certificates. An opportunity will be afforded to the eight persons who failed the course to resit the examination.

Electronic Data Processing Systems

During 1973, detailed design and programming began on the EDP systems recommended by a 1972 study as necessary to process industrial wastes data. The basic purpose of the overall system is to answer all requests for data relative to industrial wastes control in Ontario. The system has been designed to be compatible with other systems being developed within the Ministry.

Fourteen companies were approached to participate in a test program using the new system. Subsequently, many changes were made to the system, often as a result of comments and suggestions by participating companies.

The effluent monitoring system comprises 23 computer programs producing 17 error and data reports of a routing nature. Two Hundred and twenty-five companies have been listed for inclusion in the system, giving rise to records for approximately 300 plant locations. Reporting of data will be on a monthly basis.

Work is progressing on the compilation of the data necessary for the inclusion of each plant into the system. Initially, this will place a severe workload on the field staff but once the basic data are compiled, the workload will be minimal and restricted to minor updating of information.

Private Waste and Water Management

The main objective of the Private Waste & Water Management Branch is to prevent and abate pollution and human health hazards associated with private sewage disposal and private water supply systems

Consistent with this objective, the branch recommends against any subdivision or development of lands not served by municipal sewage systems or which are found unsuitable for on-site sewage disposal.

With the exception of the Muskoka-Parry Sound (Health Unit) district, direct responsibility for the control of private sewage systems currently rests with local Medical Officers of Health under provisions in The Public Health Act.

Although the Environmental Protection Act, 1971, under Part VII deals with these systems, that part only applies in areas which have been designated by proclamation. Although to date no area has been so proclaimed it is understood that all areas in the Province will be proclaimed in April 1974. Under the current arrangement a major role of the branch has been one of technical advisor and consultant to the medical officers as well as to other agencies, both provincial and municipal, and to the public.

When Part VII of the Act is proclaimed, overall responsibility for the control of private waste systems will be vested in the Ministry with provision for transferring the inspection function to regional governments and to local municipalities as deemed appropriate. In anticipation of this a new regulation respecting private sewage systems was prepared which when adopted will provide greater uniformity and standardization for such systems.

The branch provides service through a staff of 114 members and through six regional offices and eleven district offices. It is organized into three sections — Regional Operations, Cottage Pollution Control Section and Technical Services Section.

Regional Operations

The Regional Operations Section delivers the major portion of the branch's programs to the field. The following functions and service were provided by the staff through its regional and district offices:

1. Provided advice on private waste disposal and water supply to Medical Officers of Health.
2. Reviewed 180 Official Plans and Amendments and provided comments to the Ministry of Treasury, Economics and Intergovernmental Affairs.
3. Reviewed 25 Tourist Establishment License Applications and provided comments to the Ministry of Industry and Tourism, commencing in the fall of 1973.
4. Reviewed and provided comments on 51 Ontario Business Incentive Programme Loan Applications.
5. Carried out inspections of new lots proposed for development in unsewered areas as follows:

(a) Lots proposed for creation by subdivision	8,420
(b) Lots proposed for creation by severances	8,350*
	16,770

*The number of inspections was considerably greater than that shown above since the inspection of "lots to be retained" is not included in the value shown.

6. In addition to its prime role in land assessment, Regional Operations staff participated in the following activities:
   —Cottage surveys, sanitary surveys and water sampling programmes in support of Health Units.
   —Investigated emergencies such as oil spills for other Branches of the Ministry.
   —Performed a shoreline survey of Lakes St. Clair, Erie and Ontario, following the damage resulting from high lake levels.
   —Answered telephone inquiries, numbering in the thousands, concerning matters relating to private sewage disposal systems and individual well supplies.
7. In addition to the land assessment previously mentioned, the Staff of the Northern Region were directly responsible for the following activities in the Districts of Muskoka and Parry Sound under the Ministry's Agreement with the Board of Health that was executed in May of 1972:

(a) Review of septic tank-tile bed construction permit applications— domestic and commercial	3,908
(b) Inspection trips involving site inspections for construction permit applications	4,378
(c) Septic tank-tile systems inspection trips	2,449
(d) Complaints investigated	616

With the exception of subdivision lot inspections, all the activities of the Regional Operations Section showed increases in work load without an appreciable increase in field staff.

Cottage Pollution Control

The Cottage Pollution Control Program was established to detect and correct faulty private sewage disposal systems of cottages located on recreational lakes. The planned objective of the program is to investigate about 4000-4500 premises annually and, in conjunction with the owner, to undertake abatement work on those systems found to be faulty.

During the 1973/74 fiscal year 5532 waste disposal systems associated with 4218 premises were inspected and over 10,000 water samples were obtained for bacteriological analysis. Lakes involved were Balsam, Rice and MacLean in Southern Ontario and Lake of the Woods in Northwestern Ontario.

The results indicate that almost 60 per cent of the systems inspected were functioning satisfactorily, that

36 per cent were found to be inadequate and will require corrective work while 4 per cent could not be properly assessed at the time due to the lack of data readily obtainable. The latter will require a further inspection. Of the systems found inadequate the most frequent cause was the improper disposal of kitchen and sink wastes to the ground surface, which is deemed a public health nuisance.

The abatement of defective systems uncovered by the survey in the current and previous years continued with a total of 1138 agreements obtained with owners and 963 systems with corrective work completed.

Technical Services

The Technical Services Section provides technical support and advice to the branch and either directly, or indirectly through the Regional Operations and Cottage Pollution Control Sections, to local health agencies and the public involving private sewage disposal and water supply. Major objectives of the section are to develop better methods of controlling private sewage disposal and water supply systems and to find better systems.

The following investigations or services were provided:

(1) Studies on subsurface movements of septic tank effluent using radioactive and dye tracers were continued on private sewage systems located at Lake Simcoe and Lake Couchiching. About 2500 water samples were collected from bore holes drilled between the systems and lakeshore, and were analysed for chemical substances or contaminants, for radioactivity, and for coliform bacteria. Radioactive tracers were again used (of higher concentration than in 1972/73) and again it was found that much of the phosphorus originally present in the sewage became fixed in the soil. A report on the tracer study carried out in 1972 at Lake Chemong and in an area near the St. Lawrence River was published.

(2) Underdrained filter systems at the Whitby Experimental Station have been performing satisfactorily, producing final effluents with Biochemical Oxygen Demand (B.O.D.) and suspended solids in the range of 4 to 10 mg/1. Some of these filter beds have been in operation since 1969.

(3) A raised sand filter installation was planned for private sewage treatment at Orillia for construction in 1974. The project includes investigations to determine the effect of evapotranspiration, temperature changes, rainfall and treatment efficiency of the filter media.

(4) Evaluation of Aquarobic, an aerobic sewage treatment system for single family dwellings, was completed. The results of the test installation were analyzed and the report is being prepared. The system appeared to be a satisfactory alternative to septic tanks for on-site waste disposal.

(5) Meetings were held with a number of Regional Governments and Municipalities regarding the installation and monitoring of holding tank demonstration projects.

(6) The soils laboratory conducted investigations on soil research and development projects related to improving the design and effectiveness of disposal beds. Soil testing services, on a limited basis, were provided to Regional Operations. A total of 270 soil samples were received by the laboratory.

Sanitary Engineering

The programs of the Sanitary Engineering Branch deal with the management of communal water supplies to ensure their safety and adequacy and the protection of provincial waters through the provisions of adequate municipal waste water treatment facilities. Program responsibilities are accomplished by seven broad activities as follows:

- the evaluation of plans of proposed water supplies and waste water treatment facilities;
- a field program including pollution surveys, pollution complaint review, and the promotion, inspection and provision of water and waste water treatment plants;
- the prevention of pollution from water craft and activities undertaken on ice over water;
- the planning of regional water supply and waste water treatment facilities;
- pollution control on Great Lakes—Canada—Ontario and Canada/U.S. Agreements;
- nutrient input control;
- the training of water and sewage operators;
- the supervision of plumbing in the province.

Evaluation of Plants and Works

Engineering reports, plans and specifications are submitted in accordance with Sections 41 and 42 of The Ontario Water Resources Act for the purpose of obtaining approval.

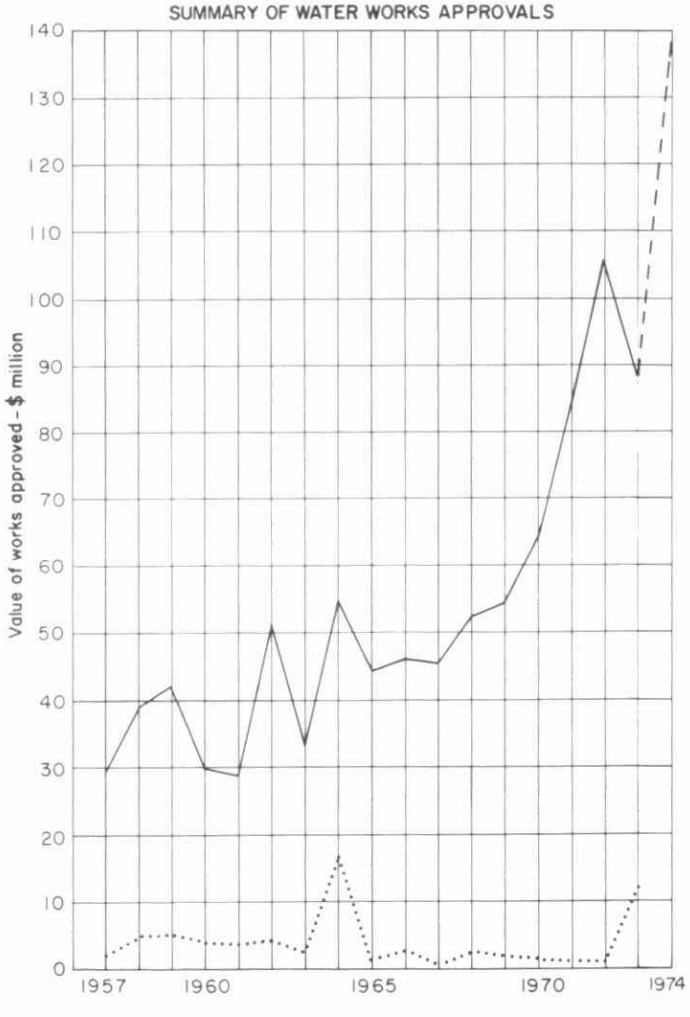
During the fiscal year 1,973 applications and engineering reports were processed. These resulted in a total of 2,549 Certificates of Approval being issued, representing a total estimated value of $436,027,516.77. Certificates issued for water works applications totalled 1,054, and involved an estimated expenditure of $138,016,846.91, compared with 981 Certificates and an estimated expenditure of $88.1 million in fiscal 1972/73.

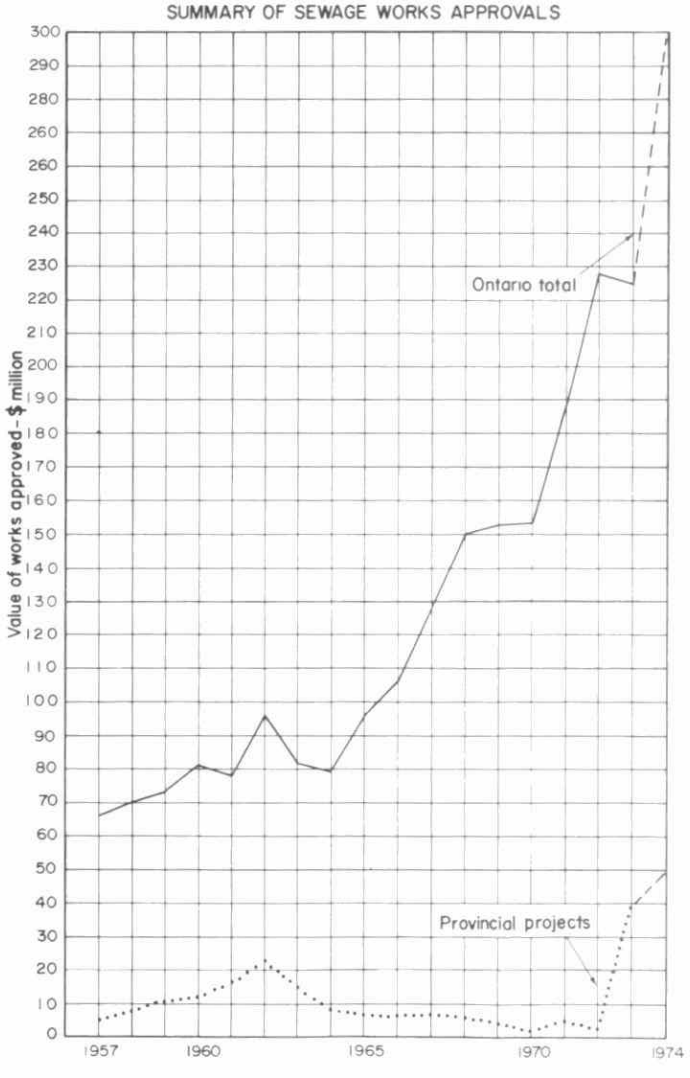
In the sewage works field, 1,495 Certificates were issued, at an estimated expenditure of $298,010,669.86, compared with 1,320 Certificates in fiscal year 1972-73 at an estimated expenditure of $225.2 million.

The accompanying graphs show the value of water and sewage works systems approved from April, 1973, to the end of the 1973/74 fiscal year.

Approvals were issued for the construction of new municipal sewage treatment plants and for extensions to 94 existing plants in the 1973-74 fiscal year.

Processing municipal CMHC loan applications for Ministry certification continued. A total of $55,298,647 was made available by CMHC for municipal projects in





1973 (calendar year), approximately $49,185,466 of which was allocated to municipalities within the lower Great Lakes drainage basin.

Pollution Abatement Incentives Act.

Certification was given as to the validity of claims for rebate under The Pollution Abatement Incentives Act.

Field Program

To ensure the availability of proper servicing for new subdivision development as it concerns water supply and pollution control, comments were provided to the Ministries of Treasury, Economics and Intergovernmental Affairs and Housing and local officials. A summary of the number of subdivisions and official plans reviewed since 1967 is provided on the accompanying graph.

The number of meetings and hearings attended by staff reflected the field staffs increase in activities, over the year 1967 to date, in the development of water supply and pollution control projects (See accompanying graph). Recognition of the importance of detecting sources of pollution so that remedial measures may be taken is reflected in the continuance of the pollution survey program.

While there has been a steady increase in the number of water and sewage installations, the number of inspections made during the year has decreased as indicated by the accompanying curves covering water works and sewage treatment plants. The reduction in the number of inspections may be related to the additional effort devoted to obtaining more control over the subdivision development to prevent future pollution problems, and the continuing increase in the number of meetings which must be held with officials concerning problem areas. Problems with communal water supply required the placing of boil water orders on Lavalee Subdivision in the Township of Cumberland, and the Villages of Bancraft, Hastings and Shelburne. Increased effort is being given by staff to ensure that operating authorities maintain bacteriological sampling control over the quality of water in communal systems.

Legal notices and Reports were prepared by this Section and executed by the Executive Director on water works for the Van den Boom private water system in the Township of King, for sewage works in the Town of Hawkesbury, the Village of Cardinal, and Casselman, the Township of Black River/Matheson and the Town of Oakville-Richview Golf and Country Club.

Legal action was initiated against the Town of Thessalon for sewage works and the appeal against the Ministry Order on the Township of Essa-McGeorge system was terminated by the owner who agreed to comply with requirements.

Legal notices and Reports are currently under preparation for the Township of Michipicoten-Wawa Trailer Park City, the Village of Shelburne Water Works and the Town of Gravenhurst-Muskoka Sands Inn sewage treatment plant. Thirteen hundred special investigations were carried out, some of which follow.

- Assistance in dealing with problems associated with high nitrate levels in private water supply systems in the Unorganized Township of Noble and Jack was provided. A chlorine dioxide generator was obtained and loaned to the City of Thunder Bay to assist with phenol problems found in the water supply.
- Regional authorities in the City of Sudbury were advised of possible phenol problems in the Wanapitei River and suggestions for overcoming these problems were provided. A demonstration of alum addition for phosphorus removal at the Canada Foils Limited lagoon was conducted.
- The addition of alum at other small lagoon installations was also supervised to assist in the evaluation of chemical treatment on such systems.

In each case the results of the chemical treatment were found to be satisfactory.

Staff were involved in the clean-up and handling of problems associated with the spill of some 50 tons of salt on highway 105 at Trail Lake. In the City of Sudbury, a complaint regarding works in the distribution system was investigated. The source of the infestation was pinpointed and it was learned that because of media fouling extensive by-passing of the Ramsay Lake microstrainer was taking place, probably allowing the midge eggs to enter the distribution system. This matter has been brought before the operating authority and corrective measures are under way.

Water Craft and Activities on Ice over Water

The program for preventing the discharge of contaminating materials from water craft and for the prevention of pollution from activities undertaken on ice over water, i.e. ice fishing, continued with new legislation covering ice fishing activities being finalized under the authority of The Environmental Protection Act.

During the 1973 season 2,231 boats were inspected, of which 66.9 per cent were of Ontario registration. (See attached figure). Violations were noted on 61 vessels bearing Ontario identification and on 102 visiting boats. The percentage of Ontario violators dropped from 6 per cent in 1972 to 4 per cent in 1973, while the percentage of violators of visiting craft remained the same at 14 per cent. The failure to reduce the visiting violators' percentage is probably because of the difficulty in prosecution once the visitors have left the province. With this in mind, the use of a summary conviction ticket is being reviewed.

Emphasis was placed on marina and yacht club inspections to ensure their compliance with Ontario (Marina) Regulation 646. A detailed inspection of the methods of disposal of sewage and refuse was made, and a report was forwarded to each of the marinas and yacht clubs inspected. At the end of the summer there were 247 pump-out stations serving the public.

During the 1973-74 winter season the ice shelter surveillance program continued. Some 2000 Ministry of Natural Resources litter bags, along with Ministry of the Environment pocket calendar brochures were distributed to ice fishermen. Particular attention was paid to the methods of sewage and refuse disposal used by the fishermen. The new regulation to control some of the environmental problems associated with ice-oriented activities is expected to be in force for the 1974-75 ice fishing season.

Staff played an active role on the Vessel Wastes Steering Committee formed by the Federal Department of the Environment. This Committee directed various engineering studies into problems associated with pollution from commercial ships on the Great Lakes.

Regional Water and Sewage Services Planning

Consultative services were provided to other branches

of the Ministry, other ministries, municipalities and the private sector in matters relating to land use planning and development, water and sewer servicing and generally the policies and programs of the Ministry. This service included the participation in engineering studies of water supply and pollution control facilities, participation on inter-ministerial advisory committees, steering committees, working groups and task forces and the evaluation of planning development and servicing proposals.

Noteworthy during the year was involvement in the housing debate with meetings and seminars being attended, briefs prepared and reviews of reports on housing, such as the Report of the Comay Task Force on Housing and the Report of the Ontario Economic Council entitled "Subject to Approval", which reviewed municipal planning in Ontario and generally housing, i.e., the York Central-Pickering area water supply and pollution control schemes which took on greater significance because of the shortage of serviced land for housing in the Metro Toronto area.

Considerable time was spent on the Regional Development Program in the Central Planning Region, for example, participation in the preparation of the plan for the Parkway Belt West from Highway 48 south of the old Town of Markham to the Dundas Valley.

The refinement of the Toronto centered Region Concept for Zone 1 which is now known as the Central Ontario Lakeshore Urban Complex (COLUC), is a continuing activity. This exercise involves the definition of target populations and the spatial arrangement of the two-tier system of urban areas along the Lake Ontario shore from Oshawa to Hamilton as conceived in the original Toronto centered Region plan.

Canada/Ontario—Canada/U.S. Agreements

The Canada/Ontario Agreement (1971) secures CMHC funding for a five-year $250 million capital works program to up-grade municipal sewage collection and treatment facilities in the lower Great Lakes. This Agreement on Great Lakes Water Quality (1972) which committed the U.S. to comparable pollution control programs.

In the first three years, $210 million have been appropriated for capital works. Forty-one sewage treatment plant projects have been completed, and 69 municipalities have initiated or completed construction of sewage collection system improvements. Ontario's program is on schedule and if it proceeds at the current level of activity through 1975, will result in eliminating the backlog of sewage works needs in the lower Great Lakes.

The capital works aspect of the Canada/Ontario Agreement has a complementary five-year, $6 million joint Federal-Provincial technology development program. This program is directed towards reducing the cost of pollution control as well as ensuring that the latest technological advances are incorporated into municipal waste treatment projects. Research is being carried out by private contractors, universities and the two levels of government.

In support of Provincial guidelines on sludge disposal, emphasis is being placed upon studies to assess the effects of sludge disposal on agricultural soils, the potential fertilizing value, pollution potential and toxicity to soils and crops.

A second major area of study centers around the control of discharges of untreated sewage from inadequate collector systems. In order to evolve a least cost strategy for attacking this problem, significant technology development funds have been allocated for mathematical modelling of sewer systems, including on-line treatment and storage alternatives. A strategy is expected to evolve by 1978.

In total, more than 80 technology development projects are being supported with $3.0 million in allocations to date.

Nutrient Input Control

Ontario's phosphorus removal requirements are categorized by areas of high priority with December 31, 1973, implementation, medium priority for implementation at undefined future dates as needs may dictate. There are 100 waste water treatment plants now in operation in the first category. By the end of 1974 all municipal plants discharging to recreational waters and the Lake Erie drainage basin will have phosphorus removal facilities in operation. By the end of 1975 in excess of 200 plants serving 85 per cent of the serviced population in the Province, are expected to be employing phosphorus removal.

Under the $6 million technology development program of the Canada/Ontario Agreement, funding is made available for phosphorus removal treatability studies at individual plants. The studies are intended to optimize financial considerations through the selection of the most appropriate chemical and the integration of treatment into existing plant processes. To date, appropriations have been made for phosphorus removal treatability studies to a value of $1.5 million.

Plumbing

Advisory activities were continued to insure that plumbing in the province was adequate to insure safety of water supplies; prevent the escape of sewer gas to building areas; insure that storm water was directed to storm sewers or ditches and that sanitary sewage was directed to the treatment works.

At the end of the fiscal year the program was transferred to the Ministry of Consumer and Commercial Relations for inclusion in the new provincial uniform building regulation program.

Training Program/Water and Sewage Works Operators

With an ever-increasing degree of urbanization and industrial development in the province, along with the expansion of recreational activities, larger and more complex water and sewage treatment works are being installed to provide people of Ontario with safe, potable water and to protect the waters of the province from pollution.

While satisfactory works may be installed there is a necessity to properly operate such works if the stated objectives are to be met. This can be achieved by increasing the number of visits made by provincial inspectors, or on the other hand, by providing the operators with the required skills to correctly operate the works and to assign the operator a legislated responsibility to ensure that the developed skills are used.

In 1971 a program was commenced to train and license operators to provide them with these necessary

skills and a legislated responsibility so the assigned goals of the Ministry could be met. While still in its developing stage, the Training and Certification Section conducted two workshops — Activated Sludge Analyses and Interpretation and Basic Gas Chlorination — and two courses — Basic Sewage Treatment Operation and Basic Water Treatment Operator — a total of 16 times during the past year.

Over 500 trainees attended these sessions, which were held at the main laboratory in Toronto. The instructor staff was composed mainly of personnel from the various branches of the Ministry.

The behavioural objective approach to training (BOAT) which emphasizes "need to know" areas was used and met with favourable comment from the participants.

Project Construction

The Project Construction Branch's main responsibility is in the administration of contracts let by the Ministry for the construction of water works and sewage works to service municipalities or groups of municipalities. Such projects are financed by the province, with, in many cases, substantial provincial subsidies which have enabled works to be constructed in areas where the cost to each householder would otherwise have been prohibitive. The branch's administration includes the overall supervision of the services provided by consulting engineers and of the work carried out by contractors.

The branch's involvement in Ministry projects commences before the construction phase as it is involved, in conjunction with other branches, in the review of design reports, drawings, specifications and other tender documents submitted by consultants engaged by the Ministry. This review is to ensure compliance with Ministry standards and requirements, to check that the schemes are soundly engineered and suitably adapted to local conditions and to minimize the chances of disputes arising with contractors.

The branch has the responsibility for co-ordinating the review specifications and quotation documents prepared to enable major items of equipment for treatment plants and pumping stations to be selected prior to the calling of tenders for the general contracts. This procedure permits the Ministry to take into account not only price but many other important factors relating to the equipment or its suppliers when making the selection.

Jobsite Inspection

During the construction phase of projects, engineers and technicians of the branch make regular visits to the jobsites to inspect the work, review progress and discuss problems. Meetings are held with municipal representatives to exchange information and to try to minimize inconvenience to citizens arising from the construction activities.

Record Expenditure

The upward trend of construction activity on Ministry projects continued in the fiscal year 1973-74 with a record high capital budget expenditure of $81 million.

During the year construction of sewage works and water works was carried out in 123 different municipalities by 102 contractors with engineering services provided by 36 consulting engineers. An average of 98 contracts were under construction during each month throughout the year with a total of 182 contracts under construction during the year.

Contracts totalling 108 with a value of $85.7 million were entered into by the Ministry during the year. (See graphs for comparison with figures for preceding years).

Claims Settlements

The completion of the $20 million extension to the Hamilton sewage treatment plant, on which the general contractor went bankrupt in late 1972, continued to cause problems especially with respect to completion of the mechanical work. Dealing with the related problems involved a considerable amount of staff time. Parts of the works were put into operation in the summer of 1973 and the whole works were eventually completed by the end of January 1974 but resolving matters with creditors, sub-contractors and the bonding company will continue for many months.

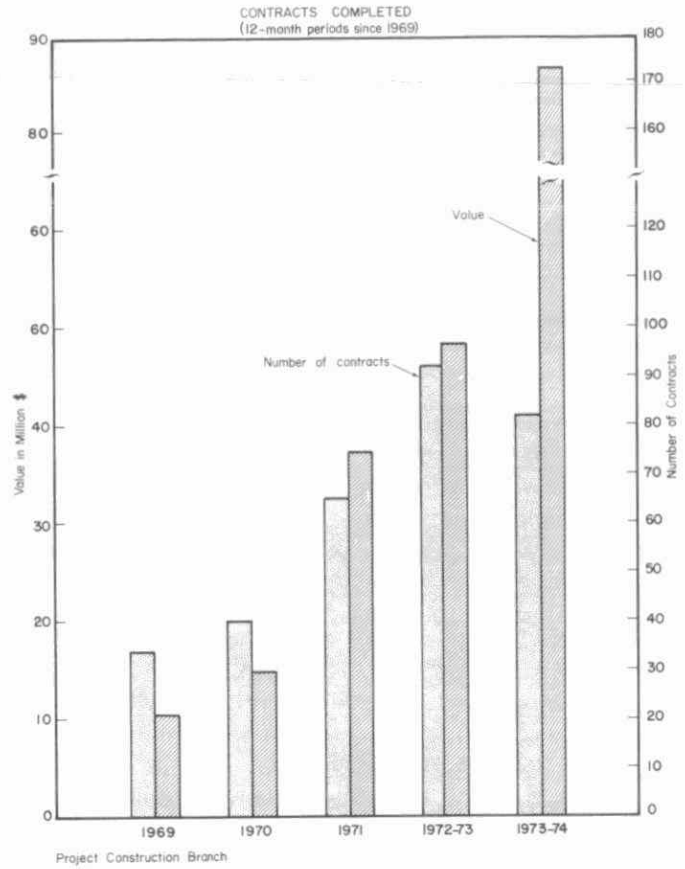
Hearings were held by a Ministry-appointed adjudicator to investigate and recommend on the validity of claims made under the Public Works Creditors Payment Act by creditors of the bankrupt sub-contractor on the Dundalk and Ridgetown projects. Labor claims were paid and the majority of the other claims were settled by either the general contractor or the Ministry.

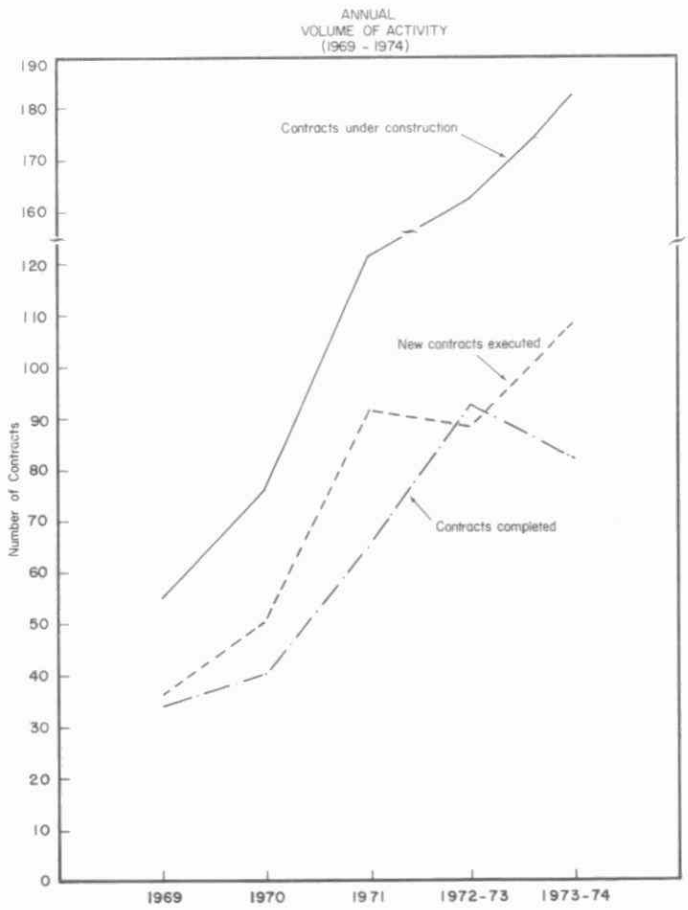
Poor performance and continuing delay by the general contractor on the Havelock sewage works project in spite of repeated warnings made it necessary for the Ministry to take the work out of the contractor's hands. The contractor was given the opportunity to make acceptable arrangements for the completion of the works but failed to do so and the Ministry advertised for tenders to complete the project. Contracts for such completion were let to two other contractors in March 1974.

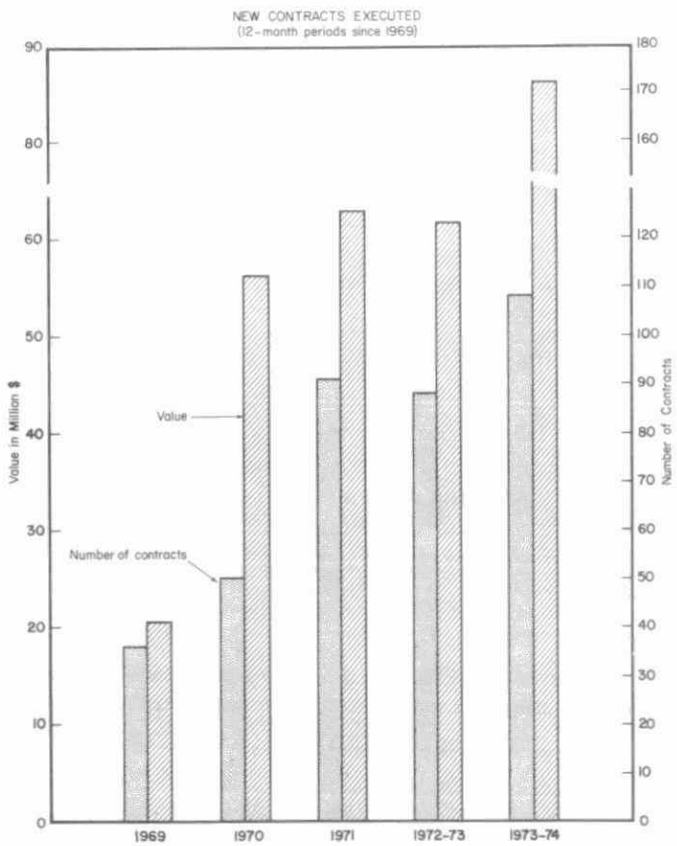
Reorganization

During the latter part of fiscal year 1973-74, preparation for the reorganization of the Ministry to become effective April 1st 1974, occupied a considerable amount of staff time. Project Construction Branch ceased to exist as such from that date, most of its responsibilities together with those of Project Development Branch being merged under the new Project Coordination Branch and certain support services being provided by the new Technical Services Branch.

It is anticipated that the upward trend of Ministry project activity will continue through fiscal 1974-75 with the capital budget reaching $115 million and with the workload on staff increasing correspondingly.


CONTRACTS COMPLETED
(12-month periods since 1969)
Value in Million $
Number of Contracts
Value
Number of contracts
1969
1970
1971
1972-73
1973-74
Project Construction Branch


ANNUAL
VOLUME OF ACTIVITY
(1969 - 1974)
Number of Contracts
Contracts under construction
New contracts executed
Contracts completed
1969
1970
1971
1972-73
1973-74


NEW CONTRACTS EXECUTED
(12-month periods since 1969)
Value in Million $
Number of Contracts
Value
Number of contracts
1969
1970
1971
1972-73
1973-74

Project Operations

The Project Operations Branch supervises the operation of all water and sewage works financed and constructed by the Ministry. Under suitable contractural agreements the Branch also operates and maintains municipally owned and constructed water and sewage treatment facilities. As of March 31, 1974 there were 458 projects operating in 256 municipalities and 7 industries (municipal: 146 water, 214 sewage; provincial: 30 water, 60 sewage; contractural: 3 water, 5 sewage) with a total of 426 operators being on staff.

Figures 1-4 graphically illustrate the total field staff, the number of projects in operation, the total capital costs and the total operating costs for the period 1957—the date of formation of the Project Operations Branch to 1973/74. Figure 5 indicates the distribution of project operating costs during 1973/74.

On April 1, 1973 all project operating staff assumed the status of Provincial civil servants as opposed to their being classified as Crown employees.

Phosphorus Removal

Under the Canada-U.S. Water Agreement 24 Ministry operated plants, discharging sewage treatment effluent into Lake Erie required the installation of phosphorus removal facilities to 1 mg/1 (in some cases to 80 per cent) by January 1, 1974.

Twenty of these were in compliance as of this date. Delay in delivery of previously ordered storage tanks prevented compliance in the case of four plants.

Twelve other plants in recreational areas required phosphorus removal by Ministry order by January 1, 1974. Seven of these were in compliance at that date. The remaining five were delayed by non-delivery of equipment.

Preliminary jar testing of all projects was conducted by Ministry personnel. The Research Branch conducted nine and the remainder were done by Project Operations staff.

General

Branch personnel continued to assist municipally operated water and sewage treatment facilities in the solution of their operating problems upon request and to maintain liaison with other Provincial Ministries interested in environmental issues.

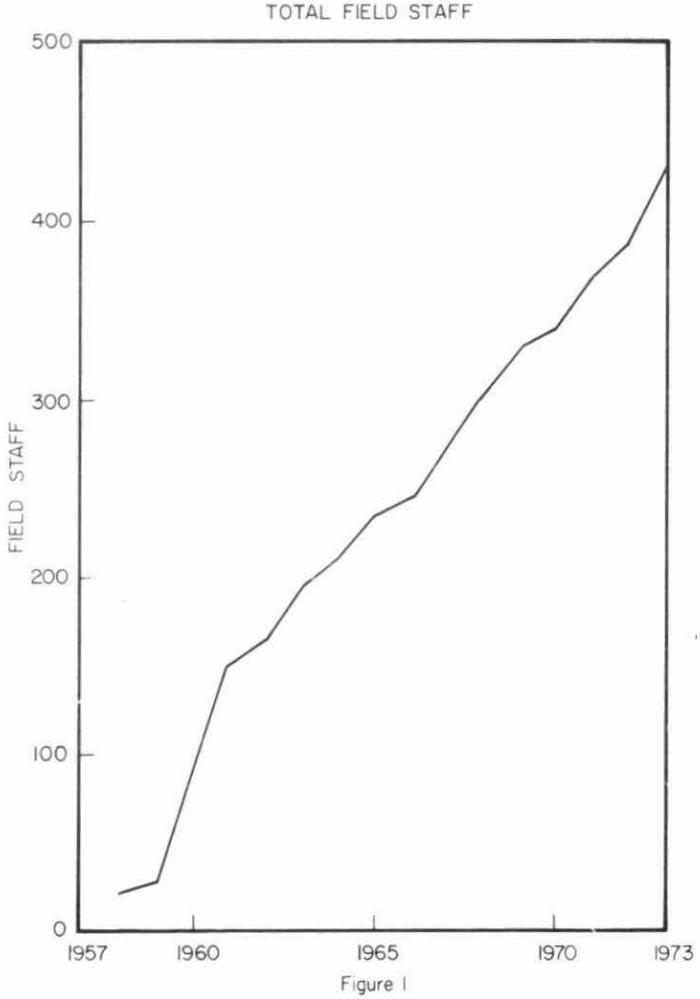


Figure 1

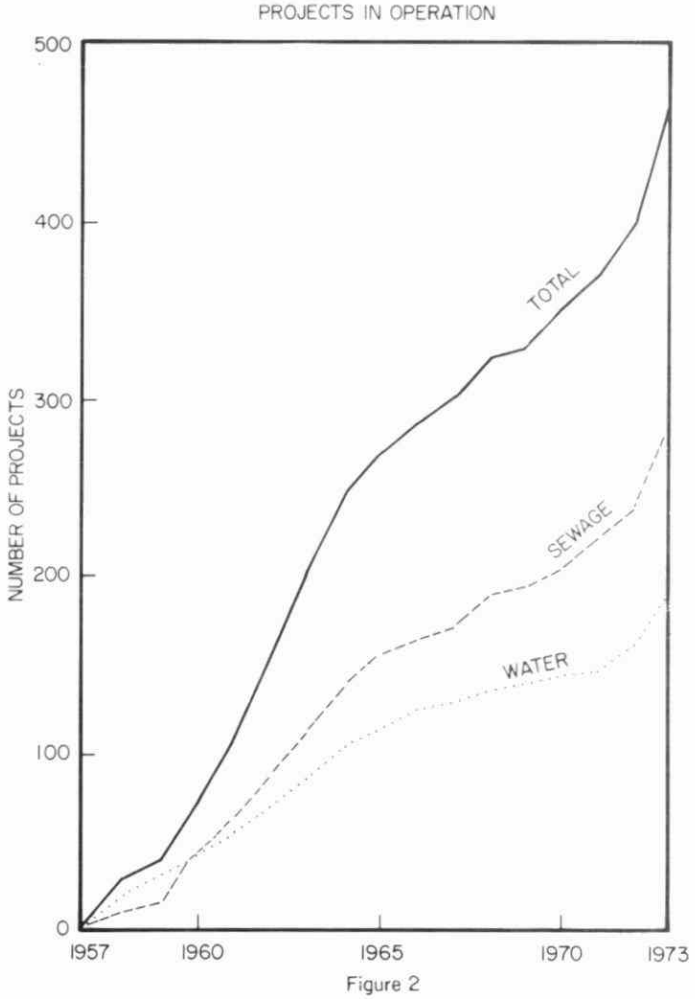


Figure 2

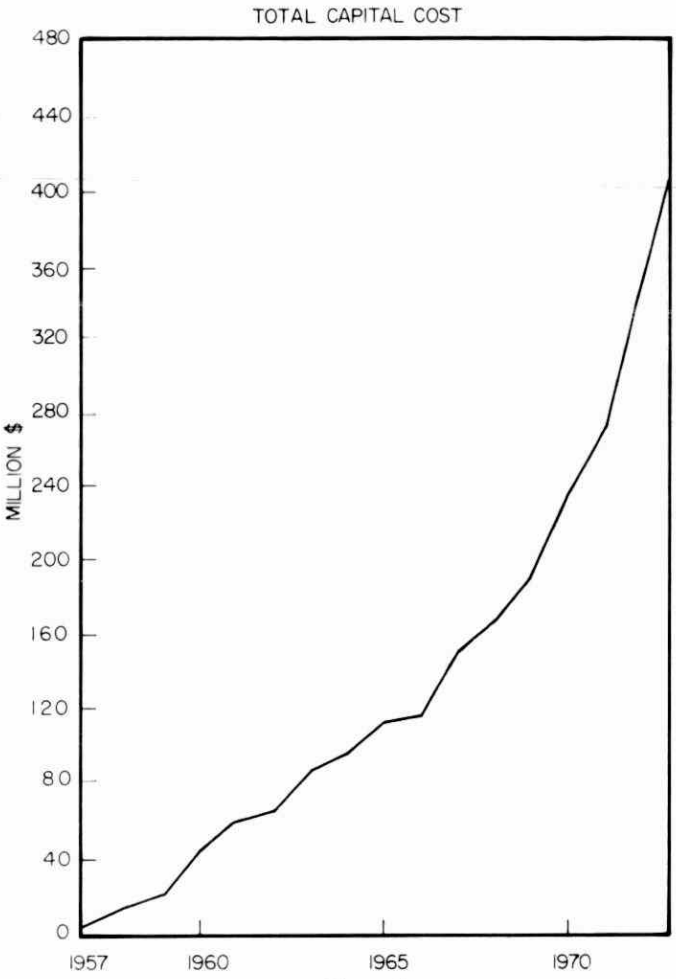


Figure 3

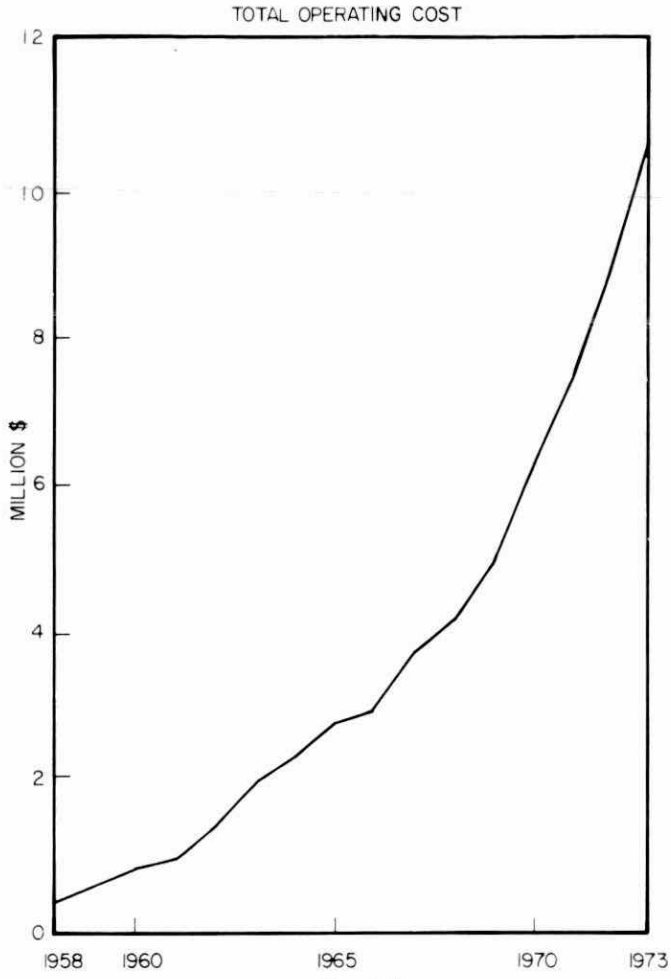
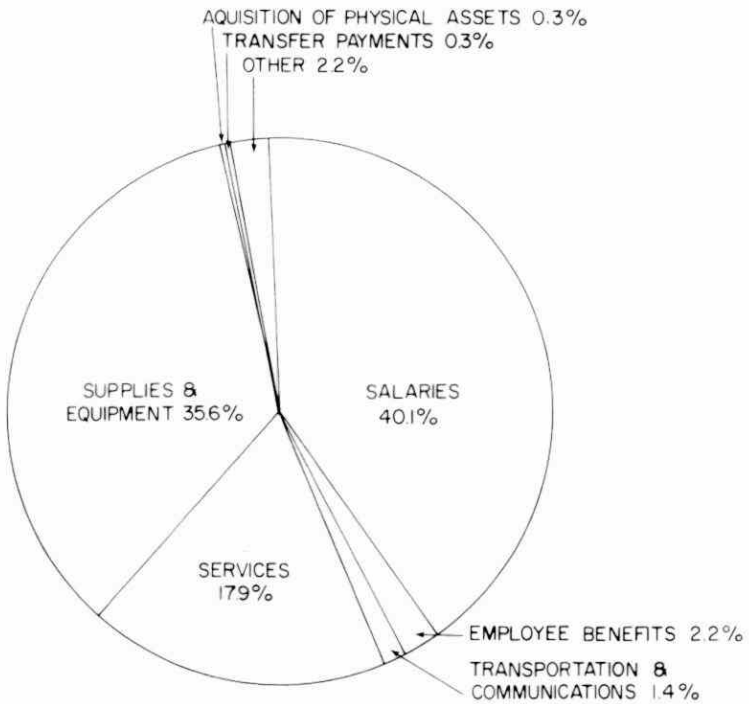


Figure 4



DISTRIBUTION OF OPERATING COSTS

Figure 5

Project Development

Prior to the reorganization of the Ministry the Project Development Branch was responsible for the development aspects of the capital construction programme. Details concerning the activities of the various sections within the branch are provided later in this report.

During the past year there have been a number of significant developments which affected the activities of the branch. Some of these are summarized below.

Financial Assistance to Municipalities

Early in the year a major change was made in the Provincial assistance programme whereby the maximum subsidy available was increased from 50 per cent to 75 per cent. At the same time the goals for water and sewage service were increased to reflect an upward trend in the cost of living generally. These changes are expected to have a considerable affect on decisions by the smaller municipalities to proceed with Provincially-financed programmes.

Regional Municipalities

With the creation of five new Regional Municipalities during the year staff continued their efforts to establish and maintain regular liaison with Regional officials.

General

Lengthy discussions continued with staff of other Ministries concerning the problem of servicing unorganized municipalities and indian communities. At year's end it appeared that new legislation would be introduced to provide for the establishment of a form of municipal organization which would permit the Ministry to proceed with the development of programmes in these areas.

Provincial Projects Section

The number of applications received for new projects was slightly greater than in the previous year. Twenty-seven new sewage programmes were requested and 16 new water programmes, with 34 applications having been accepted. The total number of new municipalities participating was 26. Final agreements were executed for 31 programmes.

The development of area projects continued to impose an increasingly heavy workload particularly in the Central York/Durham area. Detailed design work has been initiated and it is expected that the initial tenders will be called late in 1974. Considerable activity in the Nanticoke area is expected during the coming year.

Municipal Projects Section

The Municipal Projects Section received applications for a total of 23 new programmes during the year and the Ministry recommended acceptance of 20 of these. Final agreements were signed for 26 programmes.

Property Section

During the year 272 new properties were listed for acquisition, approximately half the number of the year previous. The number of purchases completed (288) was up considerably while the number of options outstanding remained essentially at the same level. A total of three expropriations was finalized leaving 84 outstanding at the end of the year. Once again it has been found necessary to make extensive use of independent negotiators in finalizing property transactions.

Strategic Planning

Environmental impact assessment became the major focus of the Strategic Planning Branch's activities during 1973-74. A capability in economic analysis was acquired at mid-year, with the recruitment of two senior environmental economists. In line with the impending Ministry re-ogranization, responsibility for implementation of program planning and dugeting systems was shifted to the Management Reporting Section of the Financial Services Branch.

Some of the more significant Strategic Planning activities during 1973-74 are summarized below.

Green Paper on Environmental Assessment

Branch staff was primarily responsible for drafting a Green Paper outlining the rationale for an environmental assessment program and presenting the advantages and disadvantages of alternative methods of structuring an assessment system. Following the Minister's release of the Green Paper in September 1973, some 5000 copies were distributed to interested organizations and individuals. Branch staff monitored the public response, which included over 175 written briefs. Staff presented a number of papers and lectures elaborating on environmental assessment proposals at meetings organized by professional associations and various interest groups. Work continues on measures to implement an environmental assessment program.

Co-ordination of Environmental Assessment Review Process

Several government ministries and agencies, as well as some private concerns, are already voluntarily preparing and submitting environmental assessments or analyses for review and acceptance by the Ministry. On these projects, branch staff is responsible for co-ordinating the Ministry's review process. Significant undertakings of staff during 1973-74 include

Input to the Solandt Commission's review of Ontario Hydro's proposed Middleport-Pickering 500 KV transmission line. A large amount of staff time was devoted to the Ministry's review of the proposals advanced by the Commission's consultants. Staff also participated in the subsequent public hearings and in the review of the Commission's final recommendations.

Branch staff is also heavily involved in the review of other Ontario Hydro transmission and generation projects. These included: Bradley Junction — Georgetown 500 KV; Lennox — Oshawa 500 KV; Nanticoke — London 500 KV; Bruce — Owen Sound 230 KV; Lennox — Picton 230 KV; Wesleyville G.S.; Pickering "B" G.S.; Bruce "B" G.S.; Bruce Heavy Water Plants "B", "C" and "D"; Thunder Bay G.S. expansion and new site selection. Staff has participated in the feasibility planning process for a variety of highway projects proposed by the Ministry of Transportation and Communications.

In preparation for the implementation of formal environmental assessment procedures, environmental analyses have been carried out on a number of the Ministry of the Environment's utility projects. The Ministry's Central York/Durham Servicing Scheme is the most significant example. This has entailed the preparation of environmental guidelines, terms of reference for environmental studies to be conducted by project consultants, the creation of opportunities for public participation, and the critical review of completed environmental studies. Although it has been necessary to accept a number of limiting decisions made in the late 1960's, this process should ensure that environmental constraints and limitations are built into the selection and design of the sewer alignment.

Staff is involved in the design and review of environmental studies for large undertakings of other ministries and agencies of the Ontario Government. Examples include Industry and Tourism's proposed Maple Mountain project, the Ontario Housing Corporation's proposed South-East City project in the Regional Municipality of Ottawa-Carleton, and a number of regional development proposals of the Ministry of Treasury, Economics and Intergovernmental Affairs.

The proposed crude oil pipeline from Sarnia to Montreal received a great deal of staff attention. In conjunction with other ministries, provincial guidelines for pipeline construction and operation have been prepared. These guidelines set out the environmental, agricultural and resource concerns which the Province expects the pipeline proponent to address in its application for required approvals. Throughout this process, there has been close liaison with officials of the National Energy Board and the federal Department of the Environment.

The environmental effects of several large private sector undertakings have been reviewed or are currently under consideration. Examples include: several major expansions proposed in the pulp and paper industry, the Nanticoke area developments and the King Mountain recreational complex near Sault Ste. Marie.

External Consulting and Liaison

Closely related to the design and review of environmental studies, staff provided advice and offered informal consultation on environmental planning matters to other ministries and agencies and to project proponents in the private sector. This function also involved the representation of the Ministry on various task forces and committees which are concerned with broad or complex environmental management issues or with informal prior assessment of major government planning or project initiatives. Within the past year these assignments included: the Joint Environmental Co-ordinating Committee (concerned with the North Pickering Community Development Project and the proposed New Toronto International Airport); the Niagara Escarpment Liaison Group, the Task Force on the proposed Lake St. Joseph-Pickle Lake New Town; and the Task Force on the Northwestern Ontario Industrial Complex.

Executive Support

Strategic Planning staff was frequently involved in special projects or assignments dealing with complex environmental issues as assigned by the Ministry Executive. This function also involved the handling of a large amount of Ministry correspondence related to environmental problems under review by the branch.

Economic and Special Studies

A number of significant studies were initiated within the past year. The development of an economic and environmental model for planning and forecasting, based on the input-output model of the Ontario economy, was one. A study of the alternative environmental management strategies applicable to the pulp and paper industry has also been initiated.

Branch staff has assembled and published an inventory of the environmental research being conducted by, or under the auspices of, the Ontario Ministry of the Environment.

Task Force Onakawana

Task Force Onakawana continued its activities for another year. Mr. V.W. Rudik succeeded J.W. Gilbert as Secretary of the Task Force. While the Task Force continued its examination of the Onakawana lignite depoits, the major part of its work during the past year was the examination of the effects on Ontario of the Baie James Project in Quebec. Branch staff provided technical support to the Task Force and carried out interviews with James Bay Corporation officials in Montreal.

The members of the Task Force, under the Chairmanship of Mr. Everett Biggs, Deputy Minister, accompanied by the Honourable James Auld and Mr. D. Caverley, Assistant Deputy Minister, toured the site of the La Grande complex.

A report on the project was completed for presentation to the Legislature. The report states that it is unlikely that there will be any significant environmental effect of the Baie James Project on Ontario. However, so very little is known of the currents, ice conditions and biological aspects of the area that it is impossible to firmly state that there will be no effect from the project on this Province.

MANAGEMENT AND OPERATIONS SUPPORT SERVICES

Financial and Administrative Services

Personnel

The efforts of the Personnel Branch during 1973-74 were directed towards completely rewriting position specifications and classification in accordance with the appropriate standards. Ninety five per cent of the positions were written and classified prior to the effective date of the reorganization. Significant recruiting activity to fill vacancies and new complements for new Ministry programs was another major activity.

With reorganization programs were devised in co-operation with the Information Services Branch for a new orientation program for the Ministry.

Legal

Personnel of the Legal Branch are on the staff of the Ministry of the Attorney General, providing a wide range of legal services to the Ministry on a solicitor-client relationship. A primary function relates to the enforcement of The Environmental Protection Act, The Ontario Water Resources Act and The Pesticides Act. The Branch reviewed and advised on a variety of orders which may be issued by Directors under the legislation. The legal function included advice as to the appropriate power to be exercised and form of documents. The Branch also screened cases being considered for prosecution, advised on the appropriate methods of gathering of evidence, and provided Counsel when these cases proceed to court, either on first instance or on appeal.

In addition, the branch provided legal advice to the operating branches, prepares Orders-in-Council, regulations, contracts and orders.

Management Reporting

The Program Planning and Evaluation Branch served as staff for the Executive Committee on all aspects of program management, responsible for the development of the Multi-Year Plan, from the conceptual stages to the completion of the Annual Estimates. In the past year a new program structure was developed to reflect the Ministry's role statement on environmental protection.

A major study into capital construction was begun, which will provide a basis for planning and control of this activity in 1974-75.

The office liaised with program co-ordinators within the Policy Field and served the Ministry's requirements to the Policy Field Committee and Management Board.

Administrative

The Administrative Services Branch provided a number of services to the Operating Branches to support the implementation and delivery of Ministry programs. These activities included Library Services, Office Services, Printing Services, Supply Services, Systems and Electronic Data Processing.

The Office of the Director played a major role in the introduction, publication, and distribution of the Ministry Policy and Procedures Manual by providing an editing and rewrite service.

Library

The Library Services holdings expanded and a significant number of users' requests were satisfied through the interlibrary loans service.

Office Services

The Office Services Section published a Records Manual, developed and implemented file, plans, conducted feasibility studies in microfilming process, and has designed and delivered an in-house program for the training of staff in records management.

The in-house facilities of the Printing Management Section processed approximately 4,000 requisitions totalling some eight million impressions. This represents an increase of approximately seven per cent over the previous year's production.

The activities of the Purchasing unit continue to show an increase over the previous fiscal years. The general inflationary trend of the market has resulted in a significant increase in the purchasing time required to research suppliers, negotiate prices and deliveries. The dollar value of purchase orders processed increased by 30 per cent.

The Ministry's programs continue to impact on the laboratory stores unit received about 151,630 samples in 1973, compared with 144,715 in 1972.

The inventory records unit was restructured and realized a major goal in its program by implementing an automated assets recording and reporting system.

Systems and E.D.P.

The Systems and E.D.P. section continued to expand its service in the program delivery and the assessment of environmental problems. In addition to the maintenance of the many existing programs, it developed and implemented programs in: utilities management information system; industrial pollution management information system; river basin water quality model; hydrologic data system and hydrologic model. A lake disperson model was refined and applied; and air quality simulation model was extended and applied.

Information Services

The Information Services Branch provided the full range of communication needs for the Ministry. A public education program served the entire school system, private citizens, groups, and the general public. A program of official openings and exhibiting at major fairs throughout the program brought the Ministry's story to the people. Complete media liaison services were offered to all communications media. These services had the full back-up support of audio visual and design staff who developed a full range of print, film and electronic aids.

Laboratory and Research

The Laboratory Branch provides support to Ministry programs by analyzing all types of environmental samples, which encompass a wide spectrum of diverse materials, for extremely small concentrations of organic, inorganic and microbiological contituents. The Laboratory is actively engaged in developing an analytical diagnostic capability to detect and identify unknown pollutants which may be present in the environment. A continuous program of method development is also carried out to ensure that the most precise and accurate analytical methods are employed.

Ecological Research

Laboratory scientists participated in a number of studies designed to elucidate the mechanisms of specific environmental phenomena.The Mercury Investigation Program embraced studies on the formation, transport and pathway of toxic mercury salts in the aquatic system, including the food chain. Mercury methylation phenomena in different types of fresh water sediments was examined, and in a separate study the ratio of methyl mercury to total mercury in Ontario fish was established.

The Sudbury Environmental Study involved laboratory chemists and microbiologists in projects aimed at assessing (1) the chemical changes occurring in selected acid lake waters after the addition of lime. (2) the bacteriological changes before and after liming in the populations and activities of the aquatic microflora in the selected reclamation lakes.

Scientists from the Air Quality Laboratory undertook environmental monitory projects, such as (1) the development of an analytical method by which polynuclear aromatic hydrocarbons can be monitored on a large scale and, (2) the analysis of benzo-a-pyrene and benzo-k-fluoranthene in the air of urban communities in Ontario.

Artificial Destratification of Lakes

Laboratory environmental scientists co-operated with Ministry biologists and Ministry of Natural Resources staff in reclamation projects on two small lakes and two reservoirs which were experiencing oxygen depletion. The technique developed involved the use of compressed air released in the form of tiny bubbles below the lake surface. The movement of the air bubbles results in mixing the different layers of stratified lake water, which leads to a more uniform and improved oxygen concentration throughout the body of water. One of the major objectives of these activities is to stimulate fish reproduction for recreational purposes in these water bodies.

Buchanan Lake, Thompson Lake, Valens and Scotch Block Reservoirs have successfully undergone treatment to date.

Quality Control Program

The involvement of the Ministry in scientific projects of national and international scope has resulted in an increased need for the implementation of a vigorous analytical quality control program. During the past year, the Laboratory Branch participated in a number of inter-laboratory comparisons in association with federal, state, provincial and industrial laboratories.

Typical of the quality control projects is the multi-laboratory inter-comparison of mercury concentrations in sediments and fish tissue, and the regular analysis of standard reference samples from the Environmental Protection Agency in Cincinnati.

An internal quality control procedure is also routinely applied to all the analytical methods used in the central and regional Ministry laboratories to detect systematic errors in the analytical procedures.

ENVIRONMENTAL TRACE CONTAMINANTS SECTION

The Environmental Trace Contaminants Section carries out chemical analyses for trace inorganic and organic constituents on water, sediment, fish and industrial and municipal discharges.

Over 150 different organic and inorganic tests are carried out at levels ranging from parts per trillion to percent concentrations. Typical tests conducted were lead, mercury, cadmium, arsenic, selenium, cyanide, pesticide residues and petroleum products.

Method Development

Special equipment and techniques were developed to increase the sensitivity in the analyses of toxic anions such as sulphides, mercaptans and arsenic. Methods for selenium in water, sediment and fish were developed with the required degree of sensitivity and precision.

Leaching tests were designed in order to establish potential harmful effects of mining wastes, dredging spoils, and solid wastes requiring disposal.

Mercury Program

Monitoring of mercury levels in the environment received particular attention. The mercury concentrations in sediment and fish in the St. Clair River and Lake St. Clair was measured, and the distribution of mercury within fish species was investigated. Samples from different stages of the aquatic food chain were analyzed to establish the mercury distribution pattern throughout the chain.

Pesticide Residues

Residues of pesticides, herbicides and polychlorinated bi-phenyl were measured in water, sediment and fish samples. A new method for hexachlorobenzene was

adapted and a technique for measuring phthalic acid esters was under development.

Staff spent considerable time evaluating the various specialized pieces of equipment currently available for isolating and identifying trace components present in the environment. Arising from these evaluations, an emission spectograph and a high pressure liquid chromatography unit.

Scientific Committees and Seminars

Several staff scientists were invited to participate in a series of expert committees such as the International Join Commission's Committee on Analytical Sampling and Methodology, the Eastern Canada Pesticide Conference, the Federal Mining Wastes Task Force, and the petroleum industry's Oil Standards of Methodology Group. Section scientists maintained contact with leading environmental scientists throughout the world, actively participated in conferences, and provided expert scientific advice within the Ministry and to other agencies engaged in environmental work.

WATER QUALITY SECTION

The Water Quality Section carries out chemical analyses for standard quality parameters on water and sediment samples taken from lakes, rivers, surface waters, ground waters and waste waters.

Method Development

A new method was developed for measuring low levels of chloride. This new technique will be of value in monitoring any slight changes which may occur in the Great Lakes system through urban runoff or industrial and municipal discharges. A rapid sensitive automated method for phenol analysis was also developed which significantly increases productivity and provides more accurate and precise data.

Phosphorus Distribution in Soils

Studies were undertaken to develop suitable methods for the fractionation of phosphates in soils and sediments. The findings from this study will be of value in an upcoming I.J.C. Land Drainage Study to assess the type and concentration of phosphorus being discharged into provincial waters as a result of agricultural runoff.

Analytical Methods Handbook

During the past few years significant breakthroughs in instrument technology has resulted in rapid changes occurring in analytical methodology. Laboratory staff have begun compiling a Ministry methodology handbook which will contain descriptions of the best available methods for analyzing environmental samples. Completion date for the handbook is scheduled for June 1974.

RESEARCH

The Research Branch has two basic responsibilities in this Ministry. It must be capable of providing advice and guidance by the application of existing knowledge and it must develop new technology in those areas where there is a demonstrated or anticipated need.

Providing technical assistance to other Branches of the Ministry and, through them, to municipalities and industries and their lengineering consultants constituted an appreciable portion of the branch's efforts in the fields of potable and wastewater treatment. Aid was provided both in dealing with problems encountered in the operation of existing plants and in the unit processes utilized in the design of new plants. In particular, considerable effort was expended in assisting in the technical implementation of the Province's phosphorus removal programme.

Phosphorus Removal

In the area of phosphorus removal from wastewaters, a number of full scale studies were conducted at various water pollution control plants as part of the continuing program originally described as "Chemical Process Criteria for Phosphorus Removal". These studies have been completed and resulted in a number of technical publications and presentations on this topic. Considerable aid was given bythe Ministry of Government Services in the implementation of phosphorus removal at Provincial Institutional wastewater treatment facilities.

While the studies on mechanical treatment plants were continuing, parallel investigations resulted in the development of two methods of providing phosphorus removal in waste stabilization pond systems, either batch chemical treatment and immediate discharge or continuous chemical addition for phosphorus removal.

Research studies, some supported by the Canada/Ontario Agreement on the Lower Great Lakes Water Quality, are being carried out in all major areas of our responsibility. One involves the construction of scale physical-chemical sewage treatment plant process for research and demonstration purposes. Another involves pilot and full-scale studies of the biological nitrogen removal process. Interim reports covering both of these studies to the end of 1973 have been prepared and the studies are continuing.

In an continuing effort to improve the efficiency of operating sewage treatment plants, a study was initiated to determine the causes, effects, and control of filamentous bacteria in the activated sludge process. Such filamentous upsets occur at frequent intervals at many plants, thereby significantly decreasing their overall efficiency.

Work with activated carbon for use in municipal wastewater treatment is continuing. With the completion of a report on carbon treatment of line treated raw sewage, emphasis has been directed towards the use of fly-ash as a substitute for powdered activated carbon. The Ontario Research Foundation was contracted to produce high carbon and pelletized fly-ash products. Studies with these materials to date have been encouraging and are being continued.

Another research study is under way at the Bolton water pollution control plant to determine if enhanced effluent quality can be obtained through the addition of powdered activated carbon and prime coagulant within an existing treatment plant. In conjunction with this work, a rotary kiln furnace has been purhcased to evaluate its suitability as a small scale carbon regeneration system.

Centrifugation of raw sewage was investigated for the purpose of evaluating its potential use as an advanced physical treatment operation. The quality of effluent obtainable from a certifuge in one or two minutes may equal or exceed that of a conventional primary sedimentation basin with a retention time of one to one and a half hours.

Another full-scale research study is being conducted at the Elmira WPCP to investigate the applicability of

thermophilic anaerobic digestion as a method of treating sewage sludge. Use of this method may effectively reduce capital costs associated with sludge stabilization in proposed treatment units.

A report published by the Ministry (Research Branch) in 1972 proposed design standards for plastic pipe intended for use in gravity sewers which the Society of Plastics Industries (SPI) felt were excessive. As a result of SPI representation to the Minister, a two-man board of arbitration has been established to review the divergence of opinion. An arbitration report is due in April, 1974.

Reverse Osmosis Treatment

The performance of a pilot scale Reverse Osmosis plant, concentrating whey at a cheese factory in the Trent River area, was monitored over ten weeks. The R.O. Unit was operated batchwise with batch size being 500-600 gallons. Whey was obtained from a number of different cheese plants, and was primarily cheddar cheese whey. The R.O. Unit was of the tubular type and was operated at 1000 psi pressure. The unit has 24 square feet membrane surface area.

Contaminant Movement Study

A study to measure the sub-surface movement of contaminants in different wastewater effluents (septic tank, lagoon and secondary) is being carried out at the Unionville water pollution control plant and in the laboratory. Field studies consist of injecting wastes into standard tile bed systems encompassed by groundwater well points and underlain by drum lysimeters; the lab study consists of a series of soil columns packed with earth from the tile beds which are fed the same effluents.

Spray Irrigation

A pilot scale system for determining the applicability of spray irrigation for ultimate disposal of effluent was tested at the Port Rowan water pollution control plant site. The system proved its potential as a quick, simple, inexpensive method for determining application rates and short-term effects on groundwater.

For the second year of operation, effluent from the Smithville lagoon was sprayed mainly on a sloping area of relatively impermeable (clay) soil to determine renovation benefits due to runoff. Approximately 9.8 MIG were sprayed on 5.1 acres over a period of five months. Runoff coefficients were determined to evaluate the effectiveness of evapotranspiration and surface absorption; different combinations of spray and rest periods were tried to relate these parameters to nutrient (N.P.) removal; plates containing nutrient agar were located in different areas of the spray field to observe airborne travel of wastewater microorganisms.

Weeping Tile Flow Studies

A previous study by the Research Branch on the quantity and quality of weeping tile flows concluded that weeping tile comprises water of high quality which does not require treatment, and consideration should be given to means of avoiding discharge of weeping tile flow into sanitary sewers. The continuation of the weeping tile studies is designed to derive a method for calculating flow quantities and to study the effects of rainfall quantity and intensity in the soil and on the water table.

Boat Waste Studies

In 1965 an investigation, which formed part of the input leading to regulation of pleasure boat toilet facilities was carried out by the Research Branch and as a result of this background, staff have this year been involved in studies now being carried out and/or contracted for by the Federal Government. In addition, input was provided for use in the proposed Federal legislation regarding toilet waste facilities for commercial ships.

Works was continued in the evaluation and testing of various chemical dispersants and sorbents which are available on the commercial market. During the year a co-operative programme was conducted with the technical staff of The Canadian Center for Inland Waters to set up and standardize procedures which may be applied for testing commercial sorbents.

Gamma Irradiation Studies

Studies on the pilot scale gamma irradiation unit installed at the Burlington Skyway water pollution control plant, were completed. The studies showed that gamma irradiation gave consistent disinfection, which remained essentially unaffected by operational upsets in the plant. No change was produced in any of the chemical parameters measured in the sewage effluent, after radiation. Besides being a consistent disinfection process, affected essentially only by the rate of flow of sewage effluent through the irradiator (i.e. on the total applied dose), the disinfected effluent from the irradiator proved to be non-toxic to goldfish; goldfish died rapidly upon exposure to the chlorinated effluent. A comprehensive report on the pilot plant operation and results is in preparation.

Direct Filtration Studies

Research in potable water production included pilot plant studies in direct filtration. This process eliminates one of the steps from conventional treatment thereby reducing capital cost; it also uses less coagulant and produces less sludge for disposal. The studies confirmed that the process is suitable for use with high rates of flow and that it can cope with the adverse raw water conditions occasionally encountered in some of the Great Lakes. A report of the studies is now being prepared.

The use of reverse osmosis in the production of potable water is also being examined. Work has been carried out on the potential for treatment of Reverse Osmosis of groundwater with high sulphate and hardness levels, to produce potable blended product water meeting Provincial Criteria for water quality. In the case of some smaller municipalities, this type of groundwater, which often also contains levels of iron high enough to cause problems in the distribution system and for the ultimate consumer, may represent the only readily available source of supply.

Color Removal

Methods of color removal were investigated in the laboratory and with a pilot plant at the Timmins Water Treatment plant. Prechlorination and/or ozonation prior to activated carbon absorption were studied; excellent colour removal was achieved, from raw water with a colour of 30 Hazen, when using ozonation alone

followed by carbon absorption. However, it appears that the carbon life was too short to warrant this method on a full scale basis since repaid exhausting occurred.

Ozonation Tests

Ozonation was used to treat, on a pilot scale basis, water from a raw well at Beeton. The water contained high ammonia and strong chloramine tastes developed when chlorination was applied for treatment. The action of the ozone also oxidized the iron and manganese present in the raw water prior to filtration. Although the iron and manganese removal was not as efficient as expected, 25,000 gallons of water treated by this method was distributed to the community. No adverse comment was received where previously taste and odor problems were common.

Blue Green Algae Studies

An internal report was prepared from a laboratory study to evaluate the effectiveness of various treatment methods for taste and odor problems in water supplies caused by the infestation of blue-green algae *(Anabaena flos aquae)*. The purpose of this study was to develop some background information to assist waterworks operators in dealing with this type of problem as the need arises.

Experimental Insulation

In 1972 the OWRC approved, as part of a water supply contract, the installation of approximately 5000 lineal feet of 24-inch diameter watermain in the Sudbury area, utilizing two inch styrofoam board to insulate the pipe which was to be installed at a minimum depth of 3.5 feet below ground level. This was to be considered as an experimental form of construction, and, under direction of Research Branch staff, a series of monitoring stations, transmitting soil temperatures from various depths along the pipe, were installed. The water main was placed in service on March 29, 1973. Data collected from the monitoring stations to date indicate that during periods of ambient air temperature change (spring and fall) a discontinuity is induced in the vertical soil temperature profile by the insulation layer. During periods of prolonged cold temperatures the insulation effect of the styrofoam is equivalent to some finite depth of soil. When more data are available this depth will be calculable. Monitoring will continue until sufficient data are available for analysis with a high degree of confidence.

Nutrient Phytoplankton Study

1973-74 saw the completion of the field work involved in the Nutrient-Phytoplankton relationship studies initiated in 1967. These studies were designed to determine the factors which result in excessive obnoxious developments of phytoplankton in the inland lakes of Ontario. From these studies, guidelines are being developed with respect to the impact of nutrient inputs amenable to control, which will minimize the impact of cultural practices on adjacent inland lakes. A total of seven research reports have been or are being prepared as a result of these studies.

Monitoring Study of Water Supplies

With a view to determining the bacterial quality of water at the consumer's tap, and to investigate bacterial deterioration within the distribution system, a monitoring study of selected water supply systems was undertaken. In all water samples, from the water plant as well as at points in the distribution system, routine coliform tests as well as total counts were carried out, with identification of the predominating organisms found at each location. Results of bacteriological testing will be correlated to various chemical parameters measured in the samples. An assessment of the types of conditions likely to result in problems in the distribution system and/or general deterioration of bacteriological quality of the water can then be made.

Grand River Recharge Study

Monthly treatability studies were carried out on water from the River Nith and Lake Conestogo as part of the Grand River Recharge Feasibility study. Based on the average and worst raw water conditions, recommendations for treating the water for either direct public consumption from the proposed Ayr reservoir or for recharge purposes to the infiltration beds were prepared.

Workshops

In conjunction with the Training and Licensing Section of the Sanitary Engineering Branch, staff presented a number of workshops on the topic "Activated Sludge Process— Analyses and Interpretation" for wastewater treatment plant operators. Also during the year staff assisted with the Basic Water Treatment, Basic Gas Chlorination, and Basic Sewage Treatment Courses by giving lectures and demonstrations and preparing a new "Advanced Water Treatment" course.

During the past year the following Research Reports were published:

W33—"Potential Water Contamination Caused by the Use of Marine Motors of the Outboard type".

W35—"The Effects of Influent Alum Injection on the Effluent from Continuous Discharge lagoons".

W42—"Land Disposal of Lagoon Effluent at Shelburne".

W43—"The Occurrence and Prevention of Frazil Ice Blockage at Water Supply Intakes".

W44—"Phytoplankton Studies in the Bay of Quinte—I".

W45—"Phytoplankton Studies in the Bay of Quinte—II".

W46—"Seston Carbon, Nitrogen, Phosphorus and Phytoplankton from Eight Southern Ontario Lakes".

2039—"Carbon Absorption of Lime Treated Primary Effluent".

Effluent Polishing Study

As a result of a demand for high quality effluents from treatment plants located in areas of limited receiving water assimilative capacity, an effluent polishing study involving filtration of both primary and secondary effluents was undertaken in 1972. This study continued with pilot scale filtration units being operated at the Napanee, Waterloo, and Bolton WPCP's. The prime objectives of the study are to determine whether a high quality effluent can be obtained through filtration of secondary effluents in conjunction with the addition of low dosages of prime coagulant and/or polyelectrolytes

and to determine the quality of effluent obtained through filtration of chemically treated sewages as well as assessing the associated operational characteristics of such filter performance.

Chlorine Disinfection

Works was continued to investigate problems encountered in the chlorine disinfection of treated effluents from secondary sewage treatment plants. The major problem at some of the treatment plants was the occurrence of high bacterial counts in treated effluent samples, despite theoretically adequate levels of chlorine residuals. At one plant, this was found to be caused by the time lapse between the sampling and the arrival of the samples at the laboratory.

Stormwater Pollution

While the problems of by-pass and combined sewer overflows are well documented and although work is continuing to further define the nature of this stormwater pollution, minimal efforts have been directed towards treatment of such wastewaters. A research study involving high rate fine mesh screening of stormwaters is being conducted at the Belleville WPCP. In conjunction with this concern over extraneous sewage flows, an assessment of the frequency, magnitude, and quality of municipal sewerage by-pass flows is being conducted in several municipalities in Southern Ontario to determine the proportion of organic and solids loadings entering the sewerage system that do not receive treatment at a water pollution control plant. It is expected that information obtained from this study will assist in the design of future plant expansions, improve the accuracy of models for stormwater flow predictions and aid in establishing treatment objectives where loading limit has been proposed for a receiving water.

AIR QUALITY LABORATORY

The Air Quality Laboratory provides an environmental analysis service to various sections of the Air Management Branch.

Environmental analyses are performed on such diverse materials as gaseous contaminants, atmospheric samples, and stack samples. A variety of analytical techniques are used, including classical and instrumental methods such as atomic absorption spectrophotometry, X-ray fluorescence and diffraction, chromatography and fluorometry. In addition, a mobile facility aids in on-site tracing and monitoring of contaminants in many areas of the province.

Requests for laboratory services are continually increasing, as reflected in the number of analyses carried out, 22 percent more than in the previous year, to a total of 83,000.

Field Investigations

The mobile laboratory was used to monitor air contaminants in Toronto, Hamilton, Douglas Point, Sarnia, Sudbury, Niagara Falls, Welland and other areas. Mercury, lead, sulphur dioxide, hydrogen sulphide and total hydrocarbons were measured, and several new continuous air analyzers were evaluated.

Heavy Metals in Air Particulate and Emissions

Many analyses were carried out for metals in air particulate samples taken from industrial, urban, residential and commercial sites and areas of high traffic density throughout the Province. Metals analyzed included lead, arsenic, cadmium, nickel and vanadium. An automated method was developed for determining extremely low arsenic concentrations in air samples by means of flameless atomic absorption spectrophotometry.

Polynuclear Hydrocarbon Survey

Work on the second year of a two-year survey of benzo-a-pyrene and benzo-k-fluoranthene levels in the air of eleven urban communities in Ontario was continued. In addition, an investigation was initiated to evaluate separation techniques for polynuclear hydrocarbons by the use of thin-layer chromatography, followed by analysis using a scanning spectrophotometer.

Further correlations were made between results obtained by standard methods and a simplified colorimetric method, with the aim of establishing a pollution index for the hydrocarbon compounds.

Vegetation and Soils

The vegetation and Soils laboratory group performed a total of 50,900 analyses, an increase of 54 per cent over that of the previous year. Much of this increase was due to intensive surveys for heavy metals in the Toronto and Hamilton areas. The metals analyzed included lead, cadmium and zinc, and the major non-metallic elements analyzed were sulphur, fluoride, chloride and boron.

Complaint Samples

A total of 260 samples, requiring approximately 1,200 analyses, were submitted for examination as a result of complaints from the public or controls on industrial emissions. This type of sample requires special treatment depending on the nature of the complaint. Microscopic, X-ray and microchemical procedures were used on many of the samples, as information on the actual compounds present was often required. Materials identified included asbestos, carbon black, quartz, paint overspray and lead oxide.

MICROBIOLOGY SECTION

The Microbiology Section carries out analyses to determine the bacteriological quality of municipal, surface and waste waters. Analyses are performed for nuisance organisms which cause taste and odor problems, or clogging of water distribution systems. The Section also operates mobile laboratories to carry out intensive surveys on-site to monitor perishable parameters or to assess the extent of the bacteriological changes occurring over short periods of time.

Great Lakes Programs—International Joint Commission

The laboratory microbiologists played an active role in planning and implementing the field analytical support work associated with these I.J.C. programs. In the Lower

Great Lakes Program, surveys were carried out on the St. Lawrence River, the Bay of Quinte, Lake Ontario, Niagara River, Lake Erie, Detroit River and the St. Clair River, for which microbiological reports are being completed by the Laboratory scientists. Areas surveyed in the Upper Great Lakes Program included the St. Mary's River, Lake Superior, Jackfish Bay, Nipigon Bay and Thunder Bay. Microbiological reports are being prepared for all of these surveys. Most of these surveys were supported by a mobile laboratory facility to provide prompt analytical services for monitoring the perishable parameters.

Recreational Lakes Program

Eighteen recreational lakes in the south-central, north-western and eastern regions were examined for water quality during the Summer of 1973. Microbiological reports on the water quality of these lakes have been completed. A computerized statistical analytical technique has been applied to interpret the significance of the changes in the bacteriological populations in these lakes. Mobile laboratories were employed in conducting all of these surveys.

Taxonomy

The methodology required to assay water samples for members of the *Pseudomonas* group of bacteria was investigated and tested. Pseudomonas is an ubiquitous bacteria which can cause eye, ear, nose, throat and skin infections.

An intensive microbial taxonomic study on MacLean Lake in Simcoe County was carried out to isolate bacteria which are suspected to be an important part of the lake's microbial biomass, and which may also provide a microbial index for qualitatively comparing the water quality of various lakes. The results from this study are under evaluation.

Training for Overseas Students

Three technicians from the Caribbean Islands of Dominica, Grenada and St. Lucia were given a three-month training course at the laboratory in microbiological techniques. This training program was carried out under the auspices of the Canadian International Development Agency in conjunction with the World Health Organization.

REGIONAL LABORATORIES

Thunder Bay

The scientific capability of the Thunder Bay laboratory was strengthened by the hiring of a chemist and a microbiologist. The laboratory continued to provide analytical support for the regional programs, and approximately 71,000 chemical and microbiological tests were performed.

Staff were also engaged in designing laboratory floor layouts for the planned new regional laboratory, for which construction will get underway during 1974.

London

During the year the London laboratory staff moved to the new Regional laboratory and office building on Adelaide Street. This new, well equipped establishment will enable the laboratory staff to provide an increasingly broad spectrum of routine environmental analyses in support of the regional programs.

Approximately 116,000 chemical and microbiological tests were carried out at the London laboratory during the past year.

Kingston Mobile Laboratory

In July 1973 a mobile laboratory was established on the property of St. Lawrence College in Kingston. This laboratory provided support for a number of Ministry monitoring programs requiring routine water and sewage sample analysis.

Sudbury Field Laboratory

During the Summer of 1973 a field laboratory was established in a Ministry of Natural Resources building in Sudbury. This laboratory provided a work base for the scientists involved in the Sudbury Environmental Study.